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ABSTRACT

As the second phase of a four-year research project on the geographic distribution of professional nurses, a study investigated what incentive or incentives motivate nurses in their choice of employment location. Data was analyzed from four sources: a survey of hospital directors of nursing, a survey of registered nurses, 1960 and 1970 U.S. Census information on individual nurses and their families, and the Survey of Employment Opportunities for Newly Licensed Nurses (conducted in 1973 by the National League for Nursing). Conclusions and policy implications were formulated for the following topics: (1) professional nurse staffing in hospitals and the impact of hospitals substituting lower-paid personnel for nurses, of nurses forming attachments to the geographic area of their schooling, and of nurses disliking the locations of the hospitals; (2) wage setting in hospitals, including the effect of unions and the relationship between wages and benefits; (3) mobility and interstate migration of nurses and their families, considering the variables of marriage and age; (4) matching nurses and jobs, focusing on the job market for, and job search by, newly licensed nurses; (5) retention in current employment, as influenced by age, marital status, spouse earnings, length of time with current employer, and type of nursing school program attended; (6) the demand for nonwage benefits according to age and marital status; and (7) nurse work hours and the effect of financial incentives. (ELG)

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EQUALIZING ACCESS TO NURSING SERVICES: The Geographic Dimension

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Division of Nursing project officer is Stanley E. Siegel, Assistant Chief, Manpower Analysis and Resources Branch.

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FOREWORD

The Division of Nursing's concern with uneven distribution of professional nurses within States and within rural and inner-city areas stems from the early 1950's. It has fostered progress in developing more sensitive measures of distribution through research and studies sponsored by the Division on vacancy rates, turnover rates, staffing patterns, and other distribution indices.

A 4-year comprehensive research effort was undertaken by the University of Florida for the Division to find a better distribution measure and to ascertain whether any single incentive or combination of incentives is likely to motivate nurses to work in underserved areas. The report of the first phase of this project was published by the Division in 1975 under the title *The Geographic Distribution of Nurses and Public Policy*. The results of the second phase of the study are reported here.

Phase II analyzes data from a survey of hospital directors of nursing and from professional nurses employed in hospitals. It contains empirical research based on individual nurses and their families from the 1960 and 1970 U.S. Census of Population and from the Survey of Employment Opportunities for Newly Licensed Nurses, conducted for the Division in 1973 by the National League for Nursing.

Migration patterns of professional nurses are examined in considerable detail, including differences by age group and marital status. Nurse preferences for specific forms of wage and nonwage compensation are analyzed. A unique feature of the study deals with the explicit consideration of some economic factors affecting the nurse's spouse.

These study findings should prove useful to all those concerned with the problem of uneven distribution of health personnel.

Jessie M. Scott

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This is a report on the second phase of a project funded by the Division of Nursing to study the many-faceted aspects of the geographic distribution of professional nurses. We owe a debt of gratitude to a number of persons who, over the 4 years of the two phases, provided both advice and support.

We are particularly grateful for the assistance provided by our project officer at the Division of Nursing, Stanley Siegel. He has advised and encouraged us throughout on conceptual matters, on aspects of our work pertaining directly to nursing, and on public policy considerations. Miss Jessie M. Scott and members of the Division of Nursing staff, Eugene Levine, Evelyn Moses, and Margaret Sheehan have given us advice and useful suggestions.

The second phase, like the first, relies extensively on data collected as part of the first phase's work. Several persons in the research community assisted us in the design of our two survey instruments. Among them are Virginia Cleland, Margaret Ellsworth, Bernard Ferber, and Mary Mullane.

A number of individuals assisted in data collection, preparation of tapes, and the computer work. Special credit is due Patrick Costello, Robert Hansen, Jerry Jackson, David Kaserman, Robin Laiminger, Carol Moses, Jon Neelands, Lynne Tartakow, and William Webber. Connie Scott conscientiously typed innumerable drafts of text and tables and also worked on data collection and assembling tables. Too numerous to mention individually are the many coders who assisted us on a temporary basis during the summer of 1973.

Several persons assisted in data analysis and report preparation during the second phase. They are Jill Cleere, Karen Ohlbieck, George Schell, Bruce Steinwald, and John Wayne. Valeda Slade provided valuable editorial assistance. The work was aided by numerous conversations with faculty colleagues. We especially thank Professors Lawrence Kenny, L. F. Lee, and G. S. Maddala for advice on technical matters. Finally, we thank the Vanderbilt's Institute for Public Policy Studies for providing financial assistance needed to turn the final report into a book.

Chapters 2 and 3 are coauthored by Professors Frank Sloan, currently at Vanderbilt, and Richard Elnicki, University of Florida. Professor Sloan is the author of the remaining chapters.

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Chapter 1
POLICY ISSUES AND OVERVIEW

Frank Sloan

Introduction

As a participant in the National Academy of Sciences' conference on ethical issues in health care noted, "The value (or ideal, or societal goal) of equal access to comprehensive health services, irrespective of income or geographic location, has now virtually the status of a platitude. Political leaders on both left and right give it at least verbal endorsement." (Outka, 1973, p. 272.) [1]

Although there is a consensus concerning the ultimate goal of equity in the delivery of health services, at least as defined in very broad terms, there is far less agreement about how the equity concept can be operationalized and measured. Experts have proposed gauging access differentials according to (1) health input differences, measured in terms of manpower and facility ratios; (2) differences in the process according to which entry into the health care system is achieved, e.g., travel and waiting time, and the process according to which health care services are delivered, e.g., use of emergency rooms; and (3) contrasts in health outcome, including improvements in health and patient satisfaction. (See, for example, Aday and Andersen, 1975.)

While experts have debated the merits and deficiencies of alternative equity concepts, political pressures have forced policymakers at both the legislative and executive levels to act. The marked rise in government expenditures on health care financing, manpower, and capital expansion programs—responses to these pressures—is well documented. Unfortunately, because of time pressures, policymakers have frequently been forced to rely on hearsay evidence and "conventional wisdom" describing the need for improving various aspects of access or the efficiency of alternative solutions to access problems. There is, on the other hand, very little justification for scholars and policy analysts to be smug about the fact that policymakers have often acted without the benefit of "hard" evidence. Such "hard" evidence has been forthcoming only infrequently.

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[1] Complete citations are given in reference lists at the end of each chapter.

Recently there has been a substantial amount of conceptual and empirical research on various aspects of access. (For example, Aday and Andersen, 1975; Berry, *et al.*, 1976; Sloan, 1977; and Sloan and Lorant, 1976, 1977). This is a very broad topic, since not only can access be characterized in terms of health care inputs, process, and outcomes, but within each of these categories there are dimensions related to income, sex, race, ethnicity, and geography. These studies have revealed some surprises. For instance, empirical research on various process indicators rather strongly suggests that urban-rural differences are not nearly as great as conventional wisdom would have them. (Berry, *et al.*, 1976, and Sloan, 1977). These findings serve to emphasize that present knowledge concerning access differentials is not nearly what it should be. Hopefully, future studies will better document the degree to which citizens in various circumstances are truly worse off in terms of health.

This book concerns one small, but nevertheless important, aspect of equity in access to health care services—geographic inequalities in the delivery of nursing services. There are essentially two broad questions that can be posed under this subject heading.

First, to what degree are nursing services inappropriately distributed? Following this question, one can ask how to describe a geographic area that is "underserved" by nurses; or equivalently, how does one determine what optimal numbers of nurses are relative to the patient populations they serve? These are the normative issues.

Second, there is a set of positive questions. Given that nursing services are inadequately distributed geographically, why is this distribution observed? And specifically, what public policies are likely to be efficacious in improving this distribution?

From an analytic perspective, it would appear necessary to solve the normative issues before investigating the positive ones. However, while often valid, this view must be rejected in the present context. At least until better answers to the normative issues are found, decisions in this sphere will be made by the political process on the basis of admittedly imprecise information. For example, public investments will be made in rural areas because people perceive these to be necessary. Seemingly ad hoc definitions of "underserved" areas will be implemented, because there is an immediate need, given Congressional actions, to define them. Analysts will and should be asked to find answers to the positive questions under the presumption that the normative issues have been solved, albeit temporarily and tentatively.

The reader will not find much analysis of the broad normative

issues here. To determine the number of nurses appropriate for specific localities on a rigorous technical basis—assuming that the distribution resulting from the normal workings of the market is inadequate—would require a considerable amount of information not currently available. For most goods and services, society does not directly concern itself with this type of issue, but rather relies completely on market forces as determinants of the distribution of goods and services. For example, there is no policy interest in the spatial distribution of barber shops or the absence of a gourmet restaurant in rural Mississippi. The questions are asked about health care because of the public's perception that the market-generated solution is inadequate in the field of health services, of which nursing services are an important element.

Answers to the normative questions about the distribution of nurses depend on judgments about the appropriate amount of health care service utilization by individuals with particular health states, the *kinds* of settings (e.g., short-term hospital versus ambulatory versus long-term care facility) most appropriate for persons with specific diagnoses and socioeconomic characteristics, and such factors as transportation patterns, the cost of *not* providing a service within a specific time interval, the degree of substitutability between professional nurses and the other types of health care personnel, the comparative costs involved in attracting various types of personnel to specific geographic areas, and the desired quality and amenity levels at which the services are to be provided.

These same questions are faced by the analyst who attempts to assess the optimal geographic distribution of physician manpower. Although the physician distribution problem is undoubtedly complex, the same normative issue, as it pertains to other types of health manpower, is still more complicated. Given the technology of health care delivery in general and, more specifically, medical and nursing practice acts that have been enacted by each of the States, the presence of a physician in a geographic area is a *sine qua non* for the delivery of a large proportion of health care services in the area. This is not true of other categories of health care personnel. Every procedure legally performed by a professional nurse may be legally performed by a physician, but the converse does not hold. Furthermore, we will show, hospital employers have been willing to substitute nonprofessional personnel for professional nurses. This certainly does not mean that these substitutions are always (or even generally) desirable; and the implications of widespread substitution for the quality of health care services, or for the optimal delegation of responsibilities, has not yet been adequately documented.

But, in any case, the potential for and consequences of various kinds of manpower substitution are crucial to determining optimal professional nurse employment ratios.

Although there have been several attempts to develop more theoretically palatable and, at the same time, reasonably operational measures to describe geographic areas where government intervention aimed at increasing the local supply of nurses is desirable, policymakers have continued to use ratios of nurses to some population denominator for this purpose (Blair and Sloan, 1975, review alternative nurse shortage measures.) Given that government intervention in this sphere is generally viewed as desirable, and given the complexities inherent in devising measures that may be more adequate conceptually, policymakers' choices may not be all that bad. Similar types of numbers are used in equity calculations in many areas of public policy. Minimum years of schooling and income minima are used in devising educational and income maintenance policies. Certainly, in determining minimum schooling levels, the thrust of policy has not been based on combinations of various types of achievement scores, but rather on numbers corresponding to educational inputs, which may or may not bear a relationship to educational outputs. Input measures are expedient in these areas for much the same reasons as those in the case of health manpower distribution.

Having argued that meaningful progress on the normative issues is unlikely, what are the researchable issues of a positive nature that are at the same time likely to be useful for policy purposes? To see the relationship between the normative and positive issues, as well as the range of alternatives potentially available for increasing the flow of nursing services in a community, the following equations are instructive.

The quantity of nursing services (Q) in a community is the product of the pool of nurses (N) in the locality, work hours per nurse (H), and nurse productivity per work hour (P).

(1.1) $Q = N \cdot H \cdot P$

Q may be less than, equal to, or greater than the quantity of nursing services desired, Q^D. A change in the quantity of nursing services delivered may be expressed as

(1.2) $\Delta Q = \Delta N \cdot H \cdot P + \Delta H \cdot N \cdot P + \Delta P \cdot N \cdot H$

According to equation (1.2), quantity changes reflect (1) changes in the pool, brought about by entry of newly graduated nurses or permanent retirements, and inmigration (outmigration) of nurses from (to) other localities, (2) changes in the nurse labor force participation and work hours per employed nurses, and (3) changes in productivity, resulting from increased (de-

creased) efficiency in production of nurses' services and/or higher (lower) efficacy of treatment. Both the levels from (1.1) and the changes from (1.2) reflect the interplay of forces on the employer and employee sides of nurse labor markets. In the absence of government interventions, levels of Q are determined that may or may not equal Q^D, irrespective of the manner in which the normative issue involving Q^D is settled.

To the extent that the political process determines that the quantity of nursing services is deficient, there are numerous policy options. To increase the number of newly graduated nurses, incentives to boost class sizes may be instituted. There is no doubt that training will increase the pool of nurses from which employers can draw. At issue is whether alternative policies can achieve the same objective more efficiently. Training is the benchmark against which alternative policies can be measured.

Nurses and their families, like the U.S. population as a whole, are geographically mobile. They move for a rather large number of reasons, only some of which relate to employment prospects. Several basic research questions should be answered before embarking on a national policy to affect nurse migration patterns.

To what extent are nurses' moves employment-related? If, for example, nurses' families give disproportionate weight to the employment prospects of nurses' spouses, it will be more difficult to influence location decisions by offering incentives to nurses. To what degree does the deficit of nurses in some communities reflect a lack of jobs for professional nurses? Of "good" jobs? A lack of community amenities?

If there is inadequate employer effective demand for nurses in the locality, supply-oriented policies, including nurse training, will miss the mark. Measures to stimulate demand for the employer's product, such as third party financing, and/or programs which lower the wage hospitals must pay nurses, such as loan forgiveness, would possibly be among the more attractive options.

A thorough analysis of any labor market should encompass both supply and demand sides. Perceiving that there has been generalized excess demand for health manpower in general and professional nurses in particular, health manpower analysts have tended to focus on the supply side. Since the mid-1970's, many experts have begun to question the notion of excess demand in health manpower markets. Ironically, the possibility exists that the apparent scarcity of nurses in some geographic areas, observable for decades, may partly reflect deficient demand for nurses in those areas; the paucity of nurses in these areas cannot, *a priori*, be completely attributed to forces on

ing on the supply-of-nurses' side of the market.

If good jobs are scarce, one must discern which, among the many-faceted features of work, matter most to nurses. Although many have strongly held opinions about the features that matter to nurses, there is a paucity of "hard" evidence on this issue. To the extent that nurses eschew certain types of communities, it is essential to identify their characteristics and the kinds of employment-related incentives that might offset these communities' negative attributes.

Neither employers nor employees are homogeneous. Informal policies should attempt to make the most of these differences. For example, if certain racial and ethnic groups are less averse to, or have a preference for, working in certain areas, the spatial distribution of nurses may be equalized by recruiting these kinds of individuals into nursing.

If one observes that nurses with particular types of training are more likely to settle in these areas, there is at least one reason for expanding the number of enrollees in educational institutions providing these types of training. Even if an association between the kind of training and location is observed, it does not necessarily follow that the educational process per se is responsible for nurse location patterns. Since the social, economic, and demographic characteristics of entrants to different kinds of training programs differ markedly, it could be the characteristics rather than education per se that is responsible for observed location patterns subsequent to graduation. The policy implications may be much the same in either case, since the characteristics of entrants are to a large extent immutable; it would probably be difficult, for instance, to convince large numbers of students from upper-middle class backgrounds to enter associate degree programs. There is also ample reason to consider nurse heterogenity in evaluating the efficacy of specific incentives. Particular incentives may or may not matter on the average, but they may potentially affect the behavior of some kinds of nurses. Such differences should be identified, and to the extent possible, incorporated into public policies.

Employers of nurses, too, are heterogenous. Our study, however, can only offer limited information on the score, since our empirical work is limited to one, albeit the dominant, employer type: the hospital.

The change in the pool of nurses in a locality reflects retention, as well as inmigration of nurses from other areas and additions of newly licensed nurses. There is no reason to believe that forces inducing inmigration operate in precisely the same manner as those governing retention, especially in view of asymmetres in

job information. Persons really first gain complete information about an employment setting while on the job; thus, the lack of particular job attributes and offerings may be more of a repellant than the presence of desirable features: an attracting force. This is an empirical issue to be investigated in the following chapters.

Equation (1.2) distinguishes between changes in the quantity of nursing services attributable to changes in the area's pool of qualified nurses and the change in work hours per qualified nurses. As Altman (1971) and others have documented, the labor force participation rate of nurses is far less than 1, and there are substantial opportunities for part-time employment, although some would argue not substantial enough. Many of the same issues addressed for N can be repeated for H. For example, nurse training potentially affects the pool, but by affecting the age distribution of nurses in a particular locality, it also influences the number of work hours nurses are willing to supply. To a limited, but nevertheless important, extent, policies aimed at increasing H are alternatives t those principally directed at increasing N. Such policies as provision of day care, permitting flexible work hours, and offering refresher courses specifically have altering levels of H as their targets. Other policies, for example, those encompassing financial incentives, such as but not limited to, loan forgiveness, potentially affect both N and H. The fact that one detects no impacts on N in empirical work should not discourage work on establishing their impacts on H. Although this study devotes less attention on the whole to determinants of nurse labor force participation and work hours, findings with regard to these variables are not pertinent to public policy. In fact, this and other studies offer much more encouragement for policies designed to increase H than for those that specifically address nurse inmigration and retention.

Jelinek and Dennis (1976), in a comprehensive review and evaluation of nursing productivity, identified more than 3,300 articles and studies on this subject. Policies addressing productivity changes certainly represent alternatives. However, to have considered productivity, as well as issues related to N and H, within the context of a single project would have resulted in an unmanageable effort. Besides stressing its potential importance this study has nothing to say about productivity issues.

Although the overall objective of this study is to develop recommendations for improving the availability of nursing services in areas currently judged to be underserved by nurses, the observational unit in each part of the study is at a level of disaggregation below the regional or community level. The locus of decisionmaking in any labor market is at the levels of the employer

and the employee; communities affect these decisions by implementing policies through their administrative, legislative, and judicial organs, but at least in our society, the final decisions in the employment sphere are not theirs. Rather, what is observed at the community level is the sum of decisions made by individual employees and employers. To understand why a given distribution of nurses and nursing services is observed, and what can be done to influence this distribution, it is desirable to conduct the analysis at the levels where decisions are made. In this study, the observational units are alternatively individual hospital employers and nurses. Nearly 70 percent of employed professional nurses work in a hospital or related institution. Thus, although hospitals do not represent the universe of nurse employers, their influence is profound. Factors affecting the hospital's decision to employ nurses and the nurses' decision to supply nursing services at a particular place and time will be reflected in community data.

Relationship to Previous Study

The present study continues research on the geographic distribution of nursing services sponsored by the Division of Nursing, U.S. Public Health Service. A book entitled *The Geographic Distribution of Nurses and Public Policy* (hereafter referred to as *The Geographic Distribution*) resulted in 1975 from the work conducted at the University of Florida under the Division's sponsorship. (See reference list for complete citation.) *The Geographic Distribution* contained (1) a review of the literature on incentives that have been seen by various writers to be effective in attracting professional nurses, as well as other types of personnel, to particular employers; (2) an assessment of alternative measures of nurse distribution—a normative analysis; and (3) original research of a positive nature on the geographic distribution of nursing services, based on national surveys of hospital directors of nursing and nurses on the staffs of the directors' hospitals conducted in 1973 as part of the study.

The Geographic Distribution presented a substantial number of detailed descriptive tables based on these surveys. Virtually none of the descriptive material will be repeated in the present book. However, many of the more important findings will be summarized in this chapter and the conclusions sections of the chapters that follow. The reader is urged to consult the earlier book for a more detailed treatment of pertinent normative issues, for details concerning the two surveys—the Survey of hospital Directors of Nursing and the Survey of Registered Nurses—as well as for the purpose of referring to tabular evidence.

The present study analyzes data from these two surveys in somewhat greater depth. Moreover, it contains empirical research based on individual nurses and their families from the 1960 and 1970 U.S. Census of Population and the Survey of Employment Opportunities for Newly Licensed Nurses conducted in 1973 by the National League for Nursing under the direction of Dr. Patricia Nash.

In the remaining section of this introductory chapter, the major findings of *The Gegraphic Distribution (GDN)* and the present study, sometimes hereafter abbreviated *EAN*, are summarized. Further discussions of the policy implications of these results are presented in the conclusions sections of the other chapters.

Summary of Findings

Sources of Variation in Professional Nurse Staffing Ratios

The Geographic Distribution examined a number of measures of nurse distribution, using data from the Survey of Hospital Directors of Nursing: shortages of RNs perceived by the director of nursing; unfilled nursing positions and positions canceled because RNs were unavailable; delegation of tasks generally considered to fall within the responsibilities of RNs to non-RN personnel ("job shifts"); and changes in hospital bed capacity because of RN unavailability. When responses to the job shift and bed capacity change questions were compared with hospitals' responses to the perceived shortage and vacancy questions, little or no relationship was evident between actions, job shifts, and capacity changes, and the latter "shortage" indicators. By contrast, RN hours per patient day, measured at the level of the individual hospital, was related to the action measures, especially job shifts (chapter 5, *GDN*). Although hardly a perfect measure of shortage, the level of full-time equivalent RN staffing does have an impact on hospital functioning.

Chapters 2 and 3 of the present book investigate sources of spatial variation in full-time equivalent RN staffing in hospitals, using the Survey of Hospital Directors of Nursing as the data base. Both chapters rely on a common analytical framework in which RN staffing levels and RN compensation are set at the level of the individual hospital. Since staffing decisions are made at the level of the employer rather than the communiy, the hospital is the unit of analysis. However, there is a direct correspondence between low staffing levels in individual hospitals in a community and communiy averages.

These are the principal findings:

• Determinants of the demand for the hospital's product have an unmistakable impact on hospital employment of nurses. One, but not the only reason, that low nurse-population ratios are observed in certain areas is deficient demand for the type of output RNs produce. Such areas tend to be poorer, as gauged by per capita income of the population, and have lower levels of physician availability, as measured by the county physician-population ratio.

This result is reassuring in one sense, but it should also serve as a warning. It is reassuring in the sense that the distribution problem will solve itself in areas undergoing economic development; but at the same time, it is very doubtful that supply-oriented policies, including nurse training and programs offering nurses special incentives to locate in underserved areas, could ever succeed in significantly boosting RN employment in "poverty pockets." The jobs must be there for nurses in ample numbers. The relationship between physician availability and the demand for nurses implies that physician and nurse manpower policies are closely linked. If physicians locate in a previously physician-poor area, the number of patients hospitalized in the area are likely to rise as well; and, as noted above, hospitals are by far the dominant employers of nurses.

• The employment of professional nurses is quite sensitive to the ratio of professional nurse compensation to that of other types of personnel. As the professional nurse becomes relatively expensive, hospitals tend to substitute other types of personnel for RNs. This phenomenon partially explains observed professional nurse staffing differentials by region. As Altman (1971) emphasized, fewer RNs are employed relative to other categories of nursing personnel in the South, where the price of unskilled labor is comparatively low. This finding suggests that RN employment could be increased if government shares part of the cost of RN compensation. Although such a policy may seem far fetched to some, such a policy is in fact now being suggested as a means for boosting employment of groups currently experiencing high unemployment rates. Presumably, however, such a measure would only be temporary.

Such programs as loan forgiveness work in much the same way. If the Government forgives an educational debt in return for a specified amount of service in an underserved area, the amount that the employer must offer is reduced to a degree. Such a subsidy is temporary, since there is a limit to the size of the educational debt incurred by an individual nurse. In *The Geographic Distribution*, we argued that this incentive is in fact quite limited, because educational debts in nursing are not that

large. Neither the previous or the present study provides a sufficient basis for recommending that government should subsidize nurse salaries; the evidence, however, does suggest that potential employers of nurses do include relative wages in their decisionmaking calculus, and subsidies would induce employers to hire more RNs. This finding is more important than it would appear to be superficially; the impact of relative wages on employment remains a matter of debate among persons charged with employment policy for the U.S. economy as a whole.

- Our empirical analysis established a definite link between the extent of basic nurse training in a State and employment of RNs by hospitals in that State. Training potentially increases the number of nurses with attachments to the State. More nurses have families and friends there; they are familiar with the environment and so on. These are all factors enhancing the relative attractiveness of a local area. In economists' terms, additional training capacity in a State shifts the supply curve of qualified nurses to the right. The shift has the effect of the entry wages of nurses (see chapter 3's evidence), which in turn increases nurse employment in States where training is widespread according to the mechanism we just discussed. There is substantial interstate variation in the numbers of nursing school graduates per capita population.

While the finding that full-time equivalent employment of RNs can be raised by expanding training capacity is a very important finding, it is essential to place this result in perspective. Holding demand for the hospital's product constant, a fall in the entry wage of professional nurses means that hospitals will use RNs for work previously performed by other types of personnel. To the extent that non-RNs do not have adequate educational preparation for performing certain functions, this transfer is desirable; yet, there may be other tasks which require little or no formal educational preparation. As relative wages of RNs fall, there may also be a tendency for employers to use RNs in the latter ways as well as the former.

The fact that nurses' wages are lower in areas with extensive training provides an indication that attachment to a locality is a factor in nurse choice of employer. The market for nurses cannot be viewed as a frictionless, national competitive market in which nurses flock to employers offering the most attractive employment inducements. Rather, to a certain extent, nurses are willing to "pay" for proximity to friends, relatives, and the like. This study has much more to say on this point later.

- It is certainly plausible to expect that nurses are less willing to supply their services to employers located in areas with high

crime rates, high pollution, and (without condoning discrimination) in areas containing high proportions of racial and ethnic minorities. If recruitment and retention of RNs are more difficult for these reasons, government might consider compensatory policies. Several alternative approaches have been utilized to identify empirically area characteristics that are unattractive to nurses; of all the characteristics evaluated in chapters 2 and 3, the most precise relationships involve descriptors of inner-city areas. This finding is consistent with a result reported in our earlier study, namely there is much more nurse resistance to employment in central cities of metropolitan areas than to rural employment (chapter 7, *GDN*). But even these relationships are not very precise. Comparatively poor results may reflect our inability to find accurate measures of area characteristics variables.

- Several past studies have alleged that hospitals possess and exercise monopsony power in the market for nurses. If so, both nurse employment and compensation will be lower than it would otherwise be, and there may be unfilled nurse positions, even in equilibrium. (See chapter 4, *GDN*.) Monopsony power is thought to be more likely in areas where a hospital is the sole, or at least the dominant, employer of nurses, e.g., rural communities. The use of monopsony power may be a reason for observing lower professional nurse-population ratios in rural areas. If so, this would weaken the case for government intervention which has the intent of raising nurse staffing ratios. Empirical tests in our study (particularly, chapter 3, *EAN*) imply that effects attributable to the use of monopsony power are very small.
- The 1974 amendments to the Taft-Hartley Act have given an impetus to collective bargaining in nonprofit hospitals. The potential effect of an RN employment cannot be predicted on conceptual grounds (chapter 2, *EAN*), but the anticipated effect on wages is clearly positive. Our results suggest unions have no impact on RN employment and only a small impact on RN wages (less than 5 percent). There is thus no reason to anticipate unionization per se will affect the distribution of nurses.

Nurse Mobility and Interstate Migration

The Geographic Distribution concluded from the Survey of Registered Nurses that:

> Nurses exhibit a substantial amount of mobility over a lifetime. A large proportion of moves are concentrated within the first few years after graduation from nursing school. Nurses generally take their first jobs in the same geographic area in which they completed their training. . . . Associate degree graduates are less mobile than graduates from other types of programs.

> Married nurses, particularly those with children, are highly immobile . . . Single nurses, who are more likely to be young, are considerably more mobile. (*GDN* p. 154)

Chapters 4 and 5 of the present study investigate migration patterns of professional nurses in far greater detail. Chapter 4 uses 1970 U.S. Census of Population data to investigate interstate movements of professional nurses and their families. This study is unique in that opportunities facing the nurse's spouse, as well as those facing the nurse, and the effects of these opportunities are explicitly considered. Chapter 5 is based on the National League for Nursing's (NLN) 1973 Survey of Employment Opportunities for Newly Licensed Nurses. Like chapter 4, the empirical analysis uses data on individual nurses as the observational unit; and like several other chapters, chapter 5 probes nurse preferences for specific forms of wage and nonwage compensation. Chapter 4 considers nurses in several age groups and distinguishes between migration patterns of married and unmarried nurses; chapter 4 deals exclusively with the newly graduated nurses' choice of employer. A move may not occur concurrently with the nurse's choice of employer. One important issue in that chapter is nurse willingness to move if she does not find an attractive position in the locality in which she received her training. Among the principal findings of chapter 4 are:

- Interstate migration declines with nurse age, and married nurses are less mobile, confirming results reported in *The Geographic Distribution*. Nurses and their families are far more mobile during the first decade after graduation than later in life. This result suggests that if a policy were designed to attract nurses to underserved areas, the target group should be young nurses, preferably single.
- The migration rates are broadly consistent with those reported in the earlier study. However, chapter 4 examines the determinants of nurse migration, and it is these results that make one pessimistic that a large-scale policy aimed at attracting nurses from adequately served to underserved areas would succeed. In assessing the results, it is appropriate to consider married and unmarried nurses separately. First, married nurses.
- Families containing nurses move to States where the spouse (always a male in this study) can earn a higher income, but the same is *not* true of nurse earnings opportunities. This pattern may be explained in economists' terms by the fact that females spend fewer years in the labor force than do males on the average. Therefore, families may reason that earnings chances of the husband should receive greater weight when opportunities of husband and wife do not coincide. Others may say this pattern

simply reflects the dominant role of husbands in family decisionmaking. Female rights have become increasingly recognized during the 1970's; the Census data pertain to moves between 1965 and 1970. Even though times are changing, there is currently no "hard" evidence to contradict our finding for the period 1965–70. To the extent that families do not move in response to financial opportunities available to nurses, it is not likely that specific monetary incentives would succeed, even though married nurses exhibit a degree of geographic mobility.

- Families containing an employed nurse are less likely to move than those not containing one. This result suggests that the asymmetry between husband and wife is more important for migration than it is for retention.
- Previous attachment to a State, as measured by State of birth, is also more important in deterring an interstate move if it is the male spouse (as opposed to the nurse) who has had the previous attachment. This pattern could be related to occupation. For example, the spouse who has lived in a State may have a family business, have local law school contacts or business school contacts. These kinds of contacts are less important in nursing. However, this result does not rule out the possibility that husbands' preferences tend to be dominant in this sphere as well.
- Professional nurse families in which the nurse is married to a professional are more likely to make interstate moves. This probably explains why baccalaureate nurses are more mobile geographically, since they are more likely to be married to a person in a professional occupation. But the nurse's move in such instances does not appear to be generally purposeful in terms of her career, but rather tends to occur for reasons of her husband's career.

Some of the literature on physician distribution emphasized the role of the wife in location decisions. While interoccupational comparisons are admittedly difficult, it certainly appears that the role of the spouse, in this case husbands rather than wives, is at least as important in the context of nurse location.

- Unmarried nurses, who as a group are not tied to a location because of husband's career interest, also do not make interstate moves for reasons of higher salary. This negative finding is consistent with the findings of nurse labor force participation and hours of work studies which show participation and work hours to be unresponsive to wages. Married nurses, by contrast, do enter the labor force and work additional hours in response to financial incentives, a result discussed more fully below.
- Amenities of a location (such as climate and crime rates) do not appear to be important determinants of geographic migra-

tion of nurses. This result is consistent with the rather imprecise findings on these variables obtained from analysis of the Survey of Hospital Directors of Nursing data base.

These are the most pertinent findings in chapter 5 on mobility and migration:

- Nurses on the average search for their first jobs as licensed nurses while a student and over a rather limited geographic area. On the average, they search over a 4- to 5-week period and have contact with four or five potential employers. At least for the initial position, the search cannot be seen as typically national in scope; nor can it be said that it typically involves a very large personal investment for the nurse. As noted above, data from the Survey of Registered Nurses indicate that mobility is higher for nurses a few years after graduation than for the newly graduated nurse. However, results from chapter 4 (*EAN*) suggest that many of these moves are for personal or familial reasons rather than in the interest of the nurse's career.
- As of 1973, the year of the NLN survey, the unemployment rate for newly licensed nurses was low, about the same as the rate for professional workers on the whole and about half of the U.S. rate at the time. There was no evidence of "cream-skimming," a phenomenon that arises in "soft" labor markets. In the context of nursing, cream-skimming could take the form of baccalaureate nurses finding jobs more readily than nurses with diplomas or associate degrees. In fact, it is found that baccalaureates spend more time in job search, a finding consistent with their higher degree of mobility. Other measures of nurse qualifications, such as accreditation status of the nursing school attended and class rank, demonstrate no relationship to the duration of job search.
- The preceding conclusion is particularly relevant because of the effect a "soft" nurse labor market would have on nurse willingness to move. Since the market as of 1973 was not soft, there was no reason for compromises in the interest of securing employment to be widespread among newly licensed nurses. However, the NLN survey asked nurses to rank various types of compromises they were or would have been willing to make in the interest of obtaining work. Moving to another location was far down the list of compromises; other adjustments were far more likely.
- Substantial variation in the job attributes stressed by newly licensed nurses is evident from analysis of the NLN survey. As one would expect, older newly licensed nurses and those with (young) children tend to emphasize the importance of family and friends as opposed to characteristics of the job per se; and this

preference in turn, is reflected in their lower mobility. As anticipated, nurses married to spouses employed in higher income occupations are less likely to stress salary and fringe benefits. Such nurses are expected to be particularly insensitive to financial incentives.

Nurse Retention in Current Employment and Job Turnover

Retention is the other side of the coin of recruitment. Historically, nurse turnover has been high, both in absolute terms and relative to other predominantly female, professional occupations and social work. In *The Geographic Distribution*, we reported that the Survey of Registered Nurses indicated the mean length of stay on a job in nursing is about 2 years. Assuming that employers of nurses allocate their resources so as to equate the marginal cost of replacing a nurse to the marginal cost of incentives needed to retain her, the high rate of voluntary quits reflects (1) a low marginal cost of replacement, measured in terms of hiring and on-the-job training outlays, and/or (2) a low responsiveness of quits to incentives (equivalently, a high marginal cost of retention). *The Geographic Distribution* contained two separate investigations, based on the Surveys of Hospital Directors of Nursing and of Registered Nurses, respectively. Chapter 6 of the present study, examines the latter base in greater depth from the vantage point of retention. All three inquiries, taken individually and in combination, clearly imply that the marginal cost of increasing nurse retention in current employment is high. This is not to say that nothing employers do has an impact on nurse quits. Rather this finding means (1) personal and family factors are more important to retention than are specific job-related incentives and (2) only in-depth investigation of the work environment offers even the possibility of revealing the effects of incentives (or disincentives) on nurse retention in current employment. While such studies are feasible on a small-scale basis, they generally prove to be impractical when applied to a national sample. Our finding in the previous study that a new diploma RN spends about 6 percent of the average tenure in training (chapter 6, *GDN*) suggests the marginal cost of replacement, measured in terms of on-the-job training costs per se, may not be very high either, and for this reason, too, hospitals have little incentive to undertake serious programs to retain nurses.

The analysis of RN turnover in *The Geographic Distribution* (chapter 6, *GDN*) suggested very few systematic relationships. A regression of quit rates, which incorporated the impacts of nine hospital characteristics and seven better job combinations, had an R^2 of 0.02, which is low by anyone's standard.

A regression designed to explain variations in the number of years the nurse intends to remain with her current employer, based on responses to the Survey of Registered Nurses, was also specified and estimated. In brief, these were the major findings.

> Holding other factors constant, nurses in their thirties, forties, and fifties plan to remain with their current employer longer than those under 30 or over 60.
>
> Nurses with children aged 2 to 6 are likely to intend to stay longer than nurses with no children or children in other age groups.
>
> Nurses who have had a large number of jobs since graduating from nursing school and nurses who have held their current job for fewer than 2 years have shorter intended stays with their current hospital employers. Particularly likely to leave in the near future are nurses who have worked for their current employer between 1 and 2 years.
>
> Supporting the results of chapter 6's (*GDN*) nurse turnover analysis, many of the hospital incentive variables perform poorly. These variables encompass shift rotation, nurse's ability to determine her own schedule, nurse option to work in a specialty for which she is trained, loan forgiveness, life and health insurance, and retirement benefit offerings. Contradicting chapter 6's results, wages and continuing education influence expected stay in the direction hypothesized. *Although salary considerations play a role in retaining nurses in current hospital employment, a substantial increase would be necessary to make a perceptible increase in retention. . . . More statistical analysis is needed before definite conclusions as to the effect of hospital incentives on retention of nurse employees can be reached.*
>
> Nurses employed by hospitals with medical school affiliations have on the average shorter expected stays. Affiliation with a degree granting school of nursing or a diploma school makes no difference in terms of retention. (*GDN* p. 212)

Cross-tabulations were also presented depicting relationships between nurse willingness to work in inner cities of major metropolitan areas and rural areas, and specific nurse characteristics. In *The Geographic Distribution*, these preference variables were assessed from the vantage point of nurse mobility (chapter 7, *GDN*). In the current study, they are *among* the dependent variables in our retention analysis. To a considerable extent, willingness to work in another setting reflects satisfaction with one's current employment situation. The regressions in chapter 6 of the current volume merit more confidence than the cross-tabulations presented earlier.

- Based on the regression analysis presented in chapter 6 of this book, the most important determinants of nurse retention are (1) nurse age, (2) marital status, (3) spouse earnings (of married nurses), (4) number of years the nurse has been with the current employer (with one of the four dependent variables tested), and (5) type of basic nursing school program attended in one case. Neither financial nor nonfinancial characteristics of hospital offerings matter, holding personal and family charac-

teristics of the nurse constant. Even the tentative conclusion from the earlier study that wages have a significant, albeit small, impact on retention in current employment is reversed. Even the small impact disappears.

The demographic mix of nurse employers is to a large extent beyond the control of the hospital employer. Nor is there much policymakers can do to affect directly the mix of nurses in a locality. If nurses with certain types of backgrounds (student age, marital status, propensity to marry men in particular professions) gravitate to certain types of nursing programs, it is possible to affect the mix in a locality indirectly by varying enrollments in each type of program. However, this is a rather blunt instrument, and the effects of this kind of policy are only realized in the long run.

We find some differences in retention according to type of basic nursing program attended, holding nurse demographic and socioeconomic characteristics constant. But there are systematic relationships between type of program attended and demographic-socioeconomic characteristics of the nurse. If, for example, associate degree programs were phased out in favor of the baccalaureate, over time, the proportions of young, unmarried, childless, white, and middle-class RN graduates would rise. And these factors do affect retention.

Labor Force Participation and Work Hours

As already noted, increasing the number of hours worked in the local labor pool is an alternative to increasing the pool itself by means of nurse training and/or policies aimed at attracting nurses from other areas. Having concluded that, as a general matter, incentives directed toward achieving a higher inflow of nurses relative to the outflow are not likely to succeed, are inducements directed toward boosting labor force participation rates and mean work hours of nurses already in the area likely to be effective? Considering the results of our two studies and other work on this subject, the answer is a qualified "yes." The qualification is necessary, because there is still room for debate on the size of the response of participation and work hours to certain explanatory influences.

The Geographic Distribution included a brief analysis of determinants of work hours *of employed nurses*, based on data from the Survey of Registered Nurses. Among the more important findings were:

> Although loan forgiveness has no discernible impact on retention (in current employment, a result confirmed by the present study), the regression results suggest it has an impact on nurse hours of work. Nurses with forgiveable

debts have an incentive to work full time and to avoid leaving the labor force for short periods of time (such as the summer).

Offering selected fringe benefits to full-time nurse employees but excluding part-time nurses from these benefits appears to have no effect on the nurse's decision to work full time.

Provision of day care facilities does not induce employed nurses to work more hours. The Survey of Registered Nurses does not allow one to analyze the impact of day care or nonlabor force participants. Such facilities may encourage nurses to work part time who otherwise would not be employed.

Salary appears to induce nurses to work more hours per year, but has no effect on the workweek of employed nurses.

As earnings of the nurse's spouse increase, nurse work hours decrease. Family income from nonemployment sources also has a negative impact on nurse hours of work. These results are consistent with past research on female labor supply by economists. (*GDN* p. 213)

Although *The Geographic Distribution* contains the first (and only) attempt to assess the impacts of loan forgiveness, day care, and other selected fringe benefits on nurse work hours, there are many studies of labor force participation and work hours of women in general and professional nurses in particular. These studies investigate the effects of wages, nonemployment income, children, age, and other demographic variables on these labor supply dimensions. The finding that loan forgiveness affects nurse work hours is an interesting one in particular, but the analysis in *The Geographic Distribution* has an important limitation, namely that it is limited to data on employed nurses. These results permit one to generalize about employed nurses, but not all nurses irrespective of employment status.

The purpose of chapter 8 of the present study is twofold: (1) to review pertinent studies, both nursing and more general studies of female labor force and work hours behavior; and (2) to present new results, using a technique recently developed by Professor James Heckman of the University of Chicago, and data on individual nurses and their families from the 1960 U.S. Census of Population. The focus of the chapter is on the impact of wage rates offered nurses on the work hours they are willing to supply. More general data bases, though including nonemployed *and* employed respondents, unfortunately do not include information on the specific employer offerings and/or public programs, such as loan forgiveness. Yet, if wages affect the amount of labor nurses are willing to supply, it is appropriate to conclude that financial incentives are likely to succeed.

The review of seven studies of nurse labor force participation reveals:

- Nurse and spouse wages tend to have significant impacts on married nurse labor force participation and work hours, with

higher nurse wages inducing nurses to work more, and higher spouse wages having the opposite effect. Although there is general agreement that nurse wages have a significant effect, there is room for debate as to this variable's importance. In fact, elasticities associated with the nurse wage variable differ by a factor of 10 or more, depending on the nature of the data base—micro (observations at the level of the individual nurse and her family) versus aggregated (observations on individuals aggregated to level of a city or a State).

Using econometric theory, it is argued that the wage elasticities in the 0.1 to 0.2 range are probably too low, and those in excess of 1.0 are probably too high. From the standpoint of policy, the higher elasticities would imply, if true, that offering financial incentives is an extremely attractive (cost-effective) approach to augmenting the effective supply of nursing services in areas judged to be underserved. The lower estimates suggest that financial incentives have a limited effect, which nevertheless is more than one can say for other dimensions of nurses' supply analyzed in earlier chapters. There is no debate about the relationship of unmarried nurse labor force participation and work hours to nurse wages; labor force participation and full-time employment is much higher for unmarried nurses, and the associated wage elasticities are uniformly low. Only the married nurse is a potentially important source of additional nursing services via the labor force participation-work hours route.

The review of nonnursing studies shows:

- There is a surprising resemblance between the nursing and the more general studies. In fact, as with the nursing studies, the elasticities vary systematically with the type of data analyzed and econometric technique employed and in like amounts. This finding suggests the underlying parameters do not differ that much between nurses and nonnurses in the context of labor force participation and work hours, but the analytic approach is crucial to the results obtained. Conceptually, this makes a great deal of sense. Both nurses and nonnurses are less likely to work if the wage is insufficient to cover the costs of carfare, day care, and the like. Often potential determinants, such as the presence or absence of meaningful refresher courses, or loan forgiveness, are unique to nursing, but the general data bases employed in the vast majority of labor force studies do not include these variables.
- To obtain wage elasticities that are "just right," labor supply equations previously estimated by Sloan-Richupan were reestimated using a modified version of a procedure recently developed by Heckman. The resulting elasticity relating work

hours of married nurses, both employed and nonemployed, to the nurse wage are quite close to the low estimates obtained with less satisfactory statistical techniques. Judging from results reported in another study, the elasticity should have been higher. A reason for the discrepancy is suggested. The new result does not change the conclusion implied by the review that although there is still room for debate as to the degree of response, married nurse labor force participation and work hours are responsive to financial incentives.

The Importance of Selected Financial and Nonfinancial Incentives to Nurses

Parts of both books assess the attractiveness of various financial and nonfinancial incentives to nurses. This work is based on the logical proposition that a necessary condition for an incentive to affect nurses' choices is that the item offered be valued in its own right. If an offering does not appeal to nurses on the average or to an important group of nurses, one cannot expect it to affect nurses' decisions.

There are several ways of ascertaining the importance of selected incentives. First, one may measure nurses' willingness to pay for certain changes in fringe benefits, working conditions, and opportunities for professional development by foregoing a portion of salary. This method was used in *The Geographic Distribution* and in chapter 7 of the present study, with the difference that the earlier volume examined cross-tabulations from the Survey of Registered Nurses, and chapter 7 assesses the demand for the same offerings using regression analysis. Parts of chapters 3 and 5 (*EAN*) also examine tradeoffs between salary and nonwage benefits, but with data from the Survey of Hospital Directors of Nursing and National League for Nursing's Survey of Employment Opportunities for Newly Licensed Nurses. Second, one can determine whether nurses take advantage of selected hospital offerings when given the option to do so. This type of analysis was conducted in *The Geographic Distribution* and chapter 7 of the present study. Third, the extent to which nurses are knowledgeable about certain offerings and/or spend their own time seeking information about them provides an indication of their importance.

Major findings from *The Geographic Distribution*, not further investigated in the present study, include:

> On the whole, nurses appear to be extremely adverse to the practice of "floating." Hospitals which require it may have to offer nurses a substantial salary differential to compensate for this practice. Single nurses, nurses without dependents, and those with diplomas or baccalaureate nursing de-

grees appear to be relatively willing to give up salary to avoid floating. The empirical basis for the conclusions regarding floating should be investigated further, particularly from the vantage point of the actual effects of "floating" on nurse choice of employer. Our present conclusion is based on a willingness-to-pay analysis.

On the whole, nurses tend to emphasize their patient load. High patient loads are likely to be a negative factor that should make it difficult for some hospitals to recruit and retain nurses. Virtually by definition, patient loads in areas "underserved" by nurses tend to be high. Substantial offsetting incentives may be needed to achieve desired nurse staffing levels.

Many nurses are not knowledgeable about many aspects of their job at the time they are hired. Many recently hired nurses do not know about opportunities for promotion to supervisory positions within their hospitals. Recently hired nurses are not particularly knowledgeable about the relative salary position of their current employer. If such nurses had recently spent a considerable amount of time comparing salaries offered by alternative employers, one would expect to have found the recently hired nurses to be particularly knowledgeable about salaries. Given this evidence as well as Survey of Registered Nurses data on the length of time the nurse spent looking for her last job (data not presented here), one gains the impression that many nurses do not select among potential employers after carefully weighing the advantages of each.

The mean amount of nurse indebtness under the Federal loan forgiveness program is so small that a direct loan forgiveness program effect on nurse location can virtually be ruled out. (*GDN* pp. 181–3)

Other conclusions on demand for nonwage benefits, found in *The Geographic Distribution*, are reassessed in this book's chapter 7. This chapter examines determinants of nurse demand for health insurance, life insurance, retirement benefits, on-the-job training and professional advancement, maternity leaves and day care, and adequate parking facilities at the hospital. While there are commonalities in the theory underlying demand equations for each benefit, there are also differences. Therefore, some generalizations are possible, but it is also useful to refer to results for individual fringe benefits.

These are some generalizations from chapter 7's analysis of nurse demand for nonwage benefits.

- As hypothesized, there is substantial variation among nurses in demand for specific nonwage benefits. This finding implies that an offering may not be valued highly on the average, but it may be quite important to nurses in a target group, for example, among the kinds of practicing nurses one could possibly attract to underserved areas.
- Perhaps the most obvious differences are attributable to nurse age. Both conceptual and empirical analysis implies that a hospital desiring to attract staff nurses in their twenties (presumably because they are more geographically mobile), would stress on-the-job training opportunities and opportunities for

professional advancement with the employer, and somewhat surprisingly, adequate parking facilities. By contrast, more senior staff nurses are more likely to be attracted by life insurance benefits and retirement plans.

- There are also systematic differences in demand for nonwage benefits according to nurse marital status. The fact that the nurse's spouse also has insurance coverage and/or a retirement plan has a *substantial* negative impact on the nurse's demand for such benefits through her employers. Clearly, when there is duplication of a particular benefit, it is not likely to be an effective employment inducement.
- Evidence is presented that the nurse is more likely to take advantage of a benefit in cases when some out-of-pocket costs may be involved if the employer pays a portion of the total cost of the benefit. Estimates of demand response to a change from no subsidization to partial subsidization are substantial.
- In some cases, demand is location-specific. For example, nurses are much more interested in good parking in large cities than in small ones. Adequate parking is clearly not a possible incentive to attract nurses to rural underserved areas. This finding shows the danger of making general inferences from localized studies. A prior study based on data from a major metropolitan area concluded that adequate parking is important to nurses.
- Some hospital offerings potentially offer collective benefits to nurses. For example, even nurses who do not expect to have children may value maternity leaves and day care as a "right" for nurses who have or are likely to have children. At least in the case of these two benefits, which are perhaps the best examples from our list of cases for which collective demand may be operative, demand is much higher among nurses who would be likely to benefit personally. This finding does not rule out the existence of collective demand, but it does suggest nurses are most interested in benefits they can use themselves.

One of chapter 3's objectives is to measure the tradeoffs between nurse wages and specific nonwage benefits. Presumably, if a hospital offers a certain nonwage benefit nurses value, it does not have to offer as high a salary to attract nurses. For the nonwage benefits considered, the tradeoff is at most small. For some (nonwage) offerings, no tradeoff is identified at all. This finding *may* imply that nurses do not value many types of benefits very highly *on the average*, but this does not rule out the possibility that they are important to some. It could also mean the benefits are not well measured.

Chapter 5 investigates the importance to newly licensed nurses of "closeness to family and friends," "orientation program and

inservice education," "work environment," "salary and fringe benefits," and "ability to continue higher education while working."

- Of these, work environment is emphasized most frequently with salary and fringe benefits a distant second.
- Nurses especially interested in salary and fringes do not devote more time to search among alternative employers than colleagues who do not stress this item. By contrast, nurses who emphasize a good working environment do, in fact, devote more of their own resources to evaluating job alternatives. Possibly, nurses who stress the work setting have a more intense interest in this job attribute. An alternative explanation is that nurses must formally apply to learn about the work environment in detail; salary information is more easily communicated via short advertisements in newspapers and professional journals. To the extent that the nature of the work environment is difficult to communicate, it may be desirable for employers to use a more direct approach to recruiting rather than devote recruitment resources to national advertising in various types of news media.
- In chapter 5, as in others, the effects of type of basic nurse training (associate, diploma, baccalaureate) tend to disappear once demographic and socioeconomic characteristics of the nurse and her family are included in the regressions. This pattern implies that training per se does not generally affect nurses' preferences; but there are differences in the personal and familial characteristics of students entering each of the programs, and several of the latter variables do matter.

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Chapter 2

PROFESSIONAL NURSE STAFFING IN HOSPITALS

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Introduction

Although there has been some concern about the availability of health care resources in the aggregate, many knowledgeable persons in the health care field have emphasized the geographic maldistribution of resources. Increased public expenditures on health manpower training has been the dominant policy response to the geographic emphasis, that is, through professional nurse loan forgiveness and per capita grants for physician training.

Despite pressure for government action, the reasons for variation in health care resources by geographic area are inadequately understood. There has been, therefore, an understandable tendency to describe geographic differences in manpower-to-population ratios, rather than to examine the causes underlying the observed differences. Without a grasp of these causes, it is impossible to assess the need for policy intervention and the range of available policy options, or to gauge the impact of specific policies. The availability of health care resources in a specific locality reflects exogenous forces on both the demand and factor-supply sides, and possibly regulatory influences as well. The relative strength of the exogenous demand and supply influences should direct the choice of policy instruments.

Issues dealing with sources of variations in professional nurse staffing levels will be addressed in this chapter. Although this research pertains directly to hospitals, results are in the main generalizable to nurse employment settings on the whole. We shall group the issues into demand, supply, and regulatory influences. In a few instances, a specific variable represents both demand and supply influences; then we mention it twice.

Demand Issues

To what degree do hospitals substitute other types of personnel for RNs when it is financially advantageous for them to do so?

This is a positive, not a normative question. Whether substitution is desirable, in terms of such variables as quality of care, is not the issue. Such forces as unionization of hospital nonprofessional personnel and increases in the statutory minimum wage could have important impacts on professional nurse employment, depending on the degree to which hospital administrators consider non-RN personnel to be close substitutes for RN personnel.

Although measures of the physician-population ratio have generally been included in empirical studies of hospital admissions, length-of-stay, and costs, the impact of physician availability cannot be determined theoretically. However, it is reasonable to hypothesize that the availability of specialist physicians is more likely to have a positive impact on the demand for hospital services (and therefore the use of inputs) than is the availability of generalist physicians.

By the 1970s, third-party reimbursement covered by far the largest proportion of hospital expense (Newhouse, *et al.*, 1974). There is, however, substantial geographic variation in the *nature* of third-party coverage. The distinction most frequently made in the literature is between cost- and charge-based reimbursement. Generally, the argument is made that cost-based reimbursement has relatively greater impact on the growth of hospital costs. Here, we are interested in the impact of cost-based reimbursement as a source of geographic differentials in professional nurse staffing.

Personal per capita income potentially affects the demand for hospital services and, through public expenditures and/or philanthropy, the hospital's budget constraint. If high income areas have higher professional nurse staffing levels, this may provide a basis for government intervention on equity grounds.

What impact do demographic characteristics of the area in which the hospital is located have on professional nurse staffing? Included in this category are the percentage of the population aged 65 and over, the health status of the under 65 population (measured by a disability days variable), and the degree to which the population is urbanized.

In most service industries, the existence of a large number of providers relative to the area's population would, other factors being constant, be expected to lower the demand for the output of any one provider and, hence, also the provider's demand for inputs. As a working hypothesis, this relationship may be applied to the hospital sector as well.

Supply Issues

To what extent do hospitals located in inner-city areas of large

Standard Metropolitan Statistical Areas, or comparatively rural areas, experience difficulty in attracting professional nurses?

Do hospitals affiliated with a medical school and/or a nursing school attract professional nurses more easily? By nursing school, we mean degree- as well as diploma-granting institutions.

Would expansion of professional nurse training facilities (class sizes) within a State make it easier for hospitals within that State to employ professional nurses? By "easier" we mean that the hospitals would be able to attract nurses at a lower level of compensation.

Aside from inner-city and rural locations, what impacts do other variables associated with the "quality of life" have on staffing? By these we mean such aspects as crime, climate, pollution, cultural opportunities, and educational opportunities for children.

Several studies have hypothesized that hospitals are monopsonists (or oligopsonists) in the market for professional nurses.[1] If so, professional nurse employment should be lower in areas where monopsony power is comparatively great.

Although the percentage of hospital employees covered by collective bargaining agreements remains small in absolute terms, coverage has risen substantially in some geographic areas. Recent changes in the Taft-Hartley law, enacted during 1974, requiring voluntary hospital employers to recognize collective bargaining units chosen by hospital employees, may be expected to substantially increase hospital unionization. *A priori*, it is impossible, even with a very simple model of hospital behavior, to predict whether the partial effect of unionization on professional nurse staffing in hospitals is positive or negative. Yet, given the rapid increase in collective bargaining in hospitals in recent years and the impetus which the recent Congressional action may be expected to have, the impact of unionization on professional nurse staffing patterns clearly commands policy interest. By unionization, we mean both the direct effect of the presence of a collective bargaining contract in the hospital *and* "threat" effects (effects of hospital A's contract on nonunionized hospital B's wages).

Regulation Issues

The rapid rate of hospital cost inflation has produced attempts at both State and Federal levels to further regulate hospitals.

[1] The term "oligopsony" refers to a situation in which a few large employers within a market area compete for the services of a particular input. Each faces an upward-sloping supply curve of labor; but, given that, in contrast to the monopsony case, there is more than one employer, therefore strategic considerations become important. See chapter 3 for a more complete explanation.

One increasingly popular approach is certificate-of-need legislation. Such legislation was given impetus with the passage of the National Health Planning and Development Act in 1974. In a recent paper, Salkever and Bice (1976) reported that a compensatory response on the part of hospitals to restrictions on increases in bed size has been an increase in assets per bed in certificate-of-need States. A pertinent question for our study concerns the degree to which certificate of need may have increased professional nurse employment in hospitals, since greater nursing skills are needed with many types of sophisticated equipment.

Several studies have documented both the increase in and the diversity of prospective reimbursement plans affecting hospitals. Many of the plans are experimental and/or apply to only a few hospitals. In this study we are concerned about the impact of the "tougher" plans on professional nurse employment and wage rates. As with certificate of need, there is a question whether professional nurse staffing levels have been affected in a meaningful way in States where such regulations applied during 1973, the year the Survey of Hospital Directors of Nursing was conducted.

Although many of the demand, supply, and regulatory issues specifically apply to professional nurse staffing in hospitals, the findings presented here have implications for professional nurse employment on the whole. As of 1972, 66 percent of all employed professional nurses were employed by hospitals (DHEW, 1974). As the simple correlations in table 1 indicate, the number of

Table 1.—Correlations among professional nurse staffing ratios [1]

	Bedside RNs per 100 average daily patients	Percent of total bedside personnel who are RNs	Hospital RNs per 1,000 hospital beds	Employed RNs per 100,000 population
Bedside RNs per 100 average daily patients	1.00	0.97	0.73	0.79
Percent of total bedside personnel who are RNs		1.00	0.64	0.81
Hospital RNs per 1,000 hospital beds			1.00	0.44
Employed RNs per 100,000 population				1.00

[1] Observational unit is the State. All correlations are statistically significant at the 5-percent level or better. Source: American Nurses' Association (1974).

professional nurses employed per 100,000 population is reasonably closely related to the number of such nurses employed by hospitals per 100 patient days, the percentage of all the nursing staff who are professional nurses, and the number of professional nurses per 1,000 hospital beds. It has been argued that professional nurse wages are determined within the hospital sector and other types of employers take these levels as exogenous (Yett, 1970). The next largest employer, nursing homes, employed only 8 percent of all employed professional nurses in 1972 (DHEW, 1974).

To address these issues, a behavioral model of professional nurse (RN) staffing and wage-setting is developed in the next section with the hospital as the observational unit. This model provides a framework for empirical analysis in both chapters 2 and 3. Demand, factor-supply, and regulatory influences are explicitly considered as potential determinants of interhospital variation in these dependent variables. The framework is sufficiently general to incorporate all types of input decisions. The third section describes our data base, while the fourth section identifies specific variables used in the empirical analysis. The fifth section presents estimated nurse-staffing equations. The most important empirical results and pertinent policy implications are examined in the final section.

The Conceptual Framework

The market for the hospital's services and the professional nurse factor market are assumed to be imperfectly competitive (i.e., they contain some monopoly elements). The hospital is assumed to be a wage-taker (as opposed to a wage-setter) in the markets for other inputs—workers in the less skilled health care occupations and in occupations not specific to the health care sector (kitchen workers, janitors, etc.), and capital inputs. Variations in hospital quality, ownership, and other characteristics probably serve to differentiate the hospital's product. Transportation factors, pertaining to both patient and the referring physician, tend to limit the product market to a localized geographic area. Finally, given that the vast majority of hospital expenditures are covered in full or in part by insurance, the payoff in searching for a lower price may be minimal.

The reasons for the contention that hospitals have some monopsony power in the RN market are (1) the fact that a small number of hospitals are often the dominant employers of nurses in a local geographic area, and (2) professional nurses have few alternative employers outside the health care field and are thought to be immobile geographically. Even if these conditions

do not hold in every local area, they appear to occur with sufficient frequency to be a meaningful working assumption for the "representative" hospital.[2] In contrast to professional nurses, less specialized labor has viable employment opportunities both in and outside the local health sector. The market for hospital capital inputs is, for all practical purposes, national.

We assume that the hospital's decision-makers possess a preference function (U).[3] It includes the quantity of service (X), the quality of services (Y), and profits or cash flow (π) as arguments:

(2.1) $U = U(X,Y,\pi;E_1)$.

The exogenous variable E_1 permits variation in hospital preferences. If $\partial U/\partial X$ and $\partial U/\partial Y$ are zero and $\partial U/\partial \pi$ is constant, one has the traditional profit-maximizing case under certainty, a reasonable assumption for the proprietary hospital. The majority of hospitals are operated on a "not-for-profit" basis, which may well mean that they are willing to "purchase" additional units of quantity and/or quality at the cost of cash flow.[4]

Profits are defined as:

(2.2) $\pi = R_1(X,Y;E_2) + R_2(E_3) - W(L;E_4)\cdot L - r\cdot N$

where:

R_1 = current revenue from patient service (either directly from the patient or from insurance).
R_2 = current revenue from nonpatient sources (public sources and/or philanthropy).
W = professional nurse compensation.
L = quantity of professional nurse labor.
r = exogenous factor price of "another" input.
N = quantity of the "other" input.
E_1,E_2,E_3 = exogenous variables pertinent to each of the functions.

The R_1 function includes the patient demand schedule for the hospital's services. The inclusion of quality (Y) in R_1 (rather than

[2] Pertinent evidence is found in Davis (1973), Hurd (1973), Landon and Link (1975), Link and Landon (1976), and Maurizi (1975). Earlier studies by Altman (1971), and Yett (1970, p. 378) also discuss the monopsony hypothesis as it applies to nurses. According to Yett, "In a survey of the thirty-one largest metropolitan hospital associations, all but one association of the fifteen replying reported having established successful 'wage-standardization' programs. (The association that did not already have such a program asked for information on how to establish one.)" Unfortunately, this quote does not reveal the prevalence of such organizations, the coverage of such contracts (whether it only includes a wage ceiling which is only rarely binding), nor the provisions for compelling individual hospitals to comply with association decisions. To the extent that such arrangements effectively constrain a number of hospitals' ability to set professional nurse wages, empirical analysis of professional nurse wage-setting by individual hospitals becomes untenable. This issue is considered in greater detail in chapter 3.

[3] The literature usually specifies that the hospital's administration, physician staff, and Board of Directors each hold varying amounts of influence in the decisionmaking process, with varying preferences for quantity, quality, and profits or cash flow. For example, see Newhouse (1970).

[4] By no means does not-for-profit per se imply either (1) that these hospitals do not make profits (see Davis, 1972); or (2) that such hospitals will not exercise monopsony power, as some have asserted (Pauly, 1969; Rosen, 1970). Profits may be used by the hospital as a source of internal funds for investment purposes, among other things.

in U alone) implies that one should observe interhospital variation in Y on grounds that persons in different market areas are willing to pay differing amounts for quality (e.g., due to income differentials). For purposes of empirical analysis of input-choice decisions, it does not matter how quality is defined. As an endogenous variable, quality does not appear explicitly in the reduced-form equations for these variables. The set of variables represented by E_2 includes demographic variables and such variables as per capita income.

Some studies—for example, Levine and Phillip (1975)—examine staffing (and/or cost), holding patient mix or qualitative aspects of the hospital approximately constant by including a set of hospital facilities variables as explanatory variables in a regression. Such variables really do not "explain" variations in staffing, but, like staffing, are largely dependent on characteristics of patients and the community at large. Since facilities, especially the more sophisticated ones, are likely to be dependent on such factors as per capita income, including facilities as explanatory variables is likely to lead to an understatement of income's impact on staffing.

The R_2 function involves nonpatient revenues anticipated by the hospital *ex ante*. It does not include "bail-out" money; the presence of the latter type of funds in unlimited amounts would imply that hospitals would expand output and quality until the marginal valuation of both items was zero. In this (improbable) case, variations in output and input choices would be fully accounted for in terms of hospital preference differences.[5] Included in E_3 are measures of the community's wealth. Empirically, it is not possible to distinguish these wealth effects from income effects on the quantity and nature of services demanded.

The function W is upward-sloping if hospitals possess a degree of monopsony power in the market for professional nurses' services.[6] Exogenous factor-supply variables include (1) descriptions of the hospital's surrounding community, e.g., whether the hospital is located in an inner-city or rural area; (2) characteristics of the hospital itself, e.g., whether the hospital is affiliated with a nursing school.

Hospital technology is embodied in the production function:

$$\Theta(X,Y,L,N;E_5) = 0 \qquad (2.3)$$

Given that the production function incorporates quality, the notion of input "inferiority" in the production of quality, particu-

[5] If only the E_3 variables were significant, we would have weak evidence to support the view that hospitals are unconstrained by market forces. Such results could, of course, also reflect other factors such as errors in variables.

[6] In our empirical work, all monetarily expressed variables have been deflated by an area price index.

larly with regard to less skilled labor categories, becomes a real possibility. Negative signs on such variables as per capita income in licensed practical nurse (LPN) staffing equations reported by Levine and Phillip (1975) suggest hospital quality is relatively income-elastic, and comparatively fewer LPNs are "required" in the production of high quality.[7] The possibility of input "inferiority" is a source of ambiguity in comparative statics analysis based on our model. State laws specify what activities RNs and LPNs may perform for patients, with more restrictions on LPNs. Hence, LPNs are inferior to RNs to the extent the laws reflect public "demands" for minimum quality levels.

The hospital selects optimal levels of X, Y, L, and N by maximizing ϕ:

$$(2.4) \qquad \phi = U(X,Y,(R_1(X,Y;E_2) + R_2(E_3) - W(L;E_4)\cdot L - r\cdot N) - \lambda\phi(X,Y,L,N;E_5).$$

Once values for these four endogenous variables have been obtained, values of R_1, R_2, and W may be obtained by substitution. Economic theory often may be used to deduce the direction of effect (positive or negative) of specific exogenous variables on the model's endogenous variables. Unfortunately, even this simple model is too complex to allow us to deduce predicted effects of exogenous variables without making a number of additional assumptions, some of which may be somewhat arbitrary.[8]

Therefore, it is best to use these equations as a means of classifying exogenous variables, and in broad terms, as a basis for evaluating our empirical results. Questions of direction and magnitude of effects must be settled empirically. To evaluate the effects of certain variables, such as the impact of insurance paying the hospital its "costs" (other than charges) with the patient having a minimal cash outlay and the impact of specific regulatory instruments, we have made simplifying assumptions necessary to obtain unambiguous predictions. In this work, the hospital production function is subsumed in a cost function with X and Y as arguments, thus eliminating explicit consideration of L and N; and one must then assume RN staffing (L) increases with the quantity (X) and quality (Y) of services.

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[7] See Hadar (1971) for a discussion of input inferiority.

[8] Theoretical solutions depend on the signs of cross-partials (1) between pairs of endogenous variables, and (2) between endogenous and exogenous variables. Unfortunately, there exists no set of restrictions on the type (1) cross-partials that by itself satisfies the second order conditions—unless, of course, one assumes that some of the cross-partials are zero. However, such restrictions generally come at a high cost in terms of reality. Although past research provides evidence on some of the parameters of the underlying structural equations, there is generally insufficient detail. For instance, it seems reasonable to assume quality is far more patient income-elastic than is quantity. But this is only a maintained hypothesis; and, given the large number of plausible explanatory variables, one would have to make many such assumptions to derive predictions from theory alone.

The Data

The principal data source is a mailed questionnaire survey, the Survey of Hospital Directors of Nursing, conducted by a team of researchers at the University of Florida during 1973. This survey is unique in that it contains detailed information on: RN, LPN, and aide-orderly staffing levels; wages paid professional nurses with specific types of formal training and experience on both present and previous jobs; fringe benefits and continuing education programs offered professional nurses; opportunities for advancement within the organization; and working conditions such as work schedules and safety of the hospital parking lot. The sample is not fully representative of U.S. short-stay hospitals, as Veterans Administration hospitals, those owned by Catholic orders or chanceries, and those located in Standard Metropolitan Statistical Areas (SMSAs) with populations between 300,000 and 750,000 have been excluded, while those in nonmetropolitan areas are somewhat overrepresented. (Additional details are presented in Schaeffer and Sloan, 1975.) The overall response rate to the survey was 72 percent, resulting in 707 responses. After excluding responses with missing values on our variables and implausible reported professional nurse staffing levels (including in a few cases hospitals without professional nurses), slightly over 500 hospitals remain for use in the analysis reported in this and the following chapter. While data on several explanatory variables are from this survey, many data are from various published and unpublished sources and these have been merged with responses from the survey.

Depending on the variable, merged data correspond to the zip code area, the county, the census "county group" (of which there are 147 in the contiguous United States), or the State in which the hospital is located. The merging process is important, as inappropriate merges are a potential source of errors in variables. The choice of area is determined on conceptual grounds as well as for reason of data availability. To characterize the neighborhood in which the hospital is located (which is among the E_i factors), we used zip code data if the hospital were located within an SMSA. Since hospitals generally draw patients from outside their immediate neighborhoods, the demand variables have been defined for the hospital's county.

Wages of non-RN personnel are estimated for each of the 147 county groups: the 1970 One Percent Public Use Sample of the U.S. Census provided 1969 wage estimates that were updated using the U.S. Bureau of Labor Statistics' 1969 and 1972 hospital industrial wage survey reports. Geographic real wage differentials in a competitive labor market largely reflect differences

in community amenities. Ideally, the wage measure would correspond to a geographic area that is homogeneous in this regard; but one may reasonably expect substantial variation in the size of such areas. The county groups are defined on the basis of economic activity and commuting patterns and, for this reason, are appropriate for our purpose.

Finally, some explanatory variables correspond to the State. In some cases, it is desirable conceptually to use a State variable, such as State regulatory legislation, or measures of the extent of professional nurse training in the State. Unfortunately, data limitations have forced us, in a few instances, to define a variable on a State basis when a smaller geographic area would have been more appropriate. All monetarily expressed variables have been deflated by an area price index. One (described in Steinwald and Sloan, 1974) is defined for the State (DFL1); the other permits variation within as well as among States (DFL2). While the latter measure would appear to be more sensitive, it introduces undesirably large differences in the cost of living between metropolitan peripheries and contiguous areas classified as nonmetropolitan.

Empirical Specification

Dependent variables in the regressions are full-time equivalent professional nurse hours per day (H) at the ith hospital and the same measure divided by the number of hospital beds (HB). Beds are thus *alternatively* treated as a deflator for the dependent variable and as an exogenous independent variable (BEDS).

There is unfortunately no realistic alternative to our treatment of hospital beds, particularly in the analysis of a single cross section of hospitals. No theory exists to enable one to predict a hospital's bed quantity without reference to its size in a previous period (such a term would appear in a dynamic model). In any case, changes in hospital bed quantities have been slow, especially when compared to other hospital decision variables.[9]

The model's exogenous variables fall into the five categories previously described; and, as we indicate, some fall into more than one category.

Preference-Production Function (E_1 and E_2)

Empirically, preference and production function variables are virtually inseparable. Hospitals with medical and/or nurse train-

[9] In terms of our model, beds are part of production function variable set (E_2). For example, between 1960 and 1970 adult and pediatric inpatient charges in Connecticut's 35 general hospitals grew at a compound rate of 13.6 percent per year; and the number of adult and pediatric patient days grew at a 2.7 percent annual compound rate.

ing facilities use low-paid (interns and residents) and unpaid (RN and LPN students) inputs in the production of hospital services. University medical school hospitals derive benefits from treating patients with complex diagnoses because of their value in the training process. Measures of professional training are: MEDSC (= 1 if the hospital is affiliated with a medical school complex); MEDSA (= 1 if the hospital is affiliated with a medical school but not as part of a university medical school complex); and NURSC (= 1 if the hospital is affiliated with a degree-granting school of nursing or offers an RN diploma itself).

Coefficients on PROPRI (= 1 for proprietary hospitals) and VOLUN (= 1 for voluntary hospitals) in our nurse staffing regressions adjust for possible patient case mix differences. If arguments about proprietaries "cream skimming" are correct, proprietaries may employ fewer professional nurses, holding other factors constant for reasons unaccounted for by the included product demand variables (Steinwald and Neuhauser, 1970). Staffing differences by type of hospital ownership may also reflect differences in efficiency or in hospital objectives (Bays, mimeo.; Clarkson, 1972; Evans, 1970; and Rushing, 1976). According to our model, Government and voluntary hospitals may be willing to purchase additional quantity and quality at their cash flow cost.

Demand (E_2)

Past empirical work indicates that real per capita disposable income (INC, defined for the hospital's county) has a positive impact on hospital patient days.[10] Unfortunately, evidence on the demand for aspects of hospital quality is lacking. Our patient health status measures are: SICK, disability days per 1,000 persons aged 15 to 65; and ELD, the percentage of the county population aged 65 and over. The variable SICK is defined for the hospital's major city if the hospital is outside such a city but within an SMSA; and for the rural areas of the State as a whole if the hospital is not located within an SMSA.

The availability of physicians in the hospital's market may affect the demand for hospital services in several ways. A greater availability of physicians may cause a shift from hospital care toward ambulatory care, thus reducing the demand for the former. Although inpatient and ambulatory care are substitutes

[10] See Davis and Reynolds (1976), Feldstein (1971), and Newhouse and Phelps (1976). Patient days are the product of the number of admissions and the length of stay per admission. Income elasticities associated with admissions are always lower than those for length of stay. In fact, in two studies—Davis and Russell (1972) and Rosenthal (1964)—income has a negative impact on admissions. However, as Davis and Russell note, the negative sign on income may reflect the absence of adequate health status measures in these equations.

in this sense, hospital quantity (X) may also be seen as complementary in that patients are admitted to a hospital only on a physician's recommendation.[11] The latter positive effect may be more important in the case of specialist physicians who spend a larger portion of their practice time in operating or delivery rooms and on hospital rounds (Warner and Adherne, 1974).

The variables PHYSG and PHYSP measure, respectively, the number of nonhospital-based, patient-care general practice and specialist physicians per 10,000 county population. At first glance, it would appear preferable to include cross-price terms (i.e., physicians' wages) for ambulatory services rather than physician-population ratios. But such price data are unavailable at a level below the State and the general practitioner-specialist distinction is not made in any published series on State physician prices.[12] Furthermore, there are direct availability effects. For example, the patient desiring specialized treatment may see a physician in another county, who in turn refers the patient to a hospital in his locale.[13] Not only would this lead to a larger quantity of services in areas with high specialist ratios, but the mean case complexity is likely to be greater in such areas as well.

The rationale for including population density measures in hospital demand equations also relates to spatial factors. Patients in low density areas must, holding other factors constant, travel longer distances for ambulatory care. When multiple visits for a given diagnosis are involved, it may be preferable to hospitalize the patient. Since patients for whom ambulatory care is a technical alternative have less serious illnesses, a higher admission rate in low density areas may be at least partially offset by shorter lengths of stay. Also, less complex cases generate less demand for "quality" (input-intensive) hospital services. For this study, we have selected the percentage of the county population living in urban areas (URB) to represent this effect. Although a measure of population per square mile of land area is often used, the extreme degree of geographic variation in that series would be misleading in the present application.

As the number of beds in other hospitals in the area increases relative to population, the demand schedule facing our respondent hospital should shift inward. The variable OBEDS is the ratio

[11] Evidence from previous studies on the effect of physician availability on hospital use is mixed. Both positive and negative signs have been reported in hospital demand studies. See Davis and Reynolds (1976), Feldstein (1971), and Newhouse and Phelps (1976).

[12] The subject of the impact of physician-population ratios on physician fees has been long debated by health economists. For a summary, see Reinhardt (1975).

[13] Considering the relative time prices of patients, as a group, and physicians, it is optimal to place a greater weight on conserving the latter's time. The fact that highly specialized facilities are concentrated in high specialist-population ratios is a market response.

of "other" short-term hospital beds to (10,000) population in the hospital's county.

The growth in hospital insurance coverage in the recent decades is thought by many to explain a large proportion of the hospital cost inflation observable over these years. In assessing the effect of insurance, one must be concerned with its nature as well as the percentage of total hospital expense covered. Since, by the 1970's, the percentage of hospital expense covered by insurance has become very high, questions about the potential impacts of various kinds of coverage, rather than the extent of coverage, have become relatively important.

The heterogeneous nature of health insurance results in complex theoretical and empirical issues. The dimensions of the heterogeneity are (1) the amount hospitals can legally receive directly from third parties for insured care, e.g., charges or variously defined costs—costs-plus or costs-minus; (2) the part of the legal bill for which the patient is liable, e.g., deductibles under Medicare and charge minus third-party payment differences under indemnity insurance; (3) the extent of supplemental insurance coverage held by patients, e.g., major medical insurance which reimburses the patient if he documents his payments to the hospital for charge-indemnity differentials; and (4) the extent of insurance coverage for physician services in and out of the hospital. These issues are discussed in appendix A, as is our insurance measure.

Our insurance measure is COST, the estimated percentage of the hospital's county population covered by cost-based hospital insurance. It includes Medicare and Medicaid coverage and Blue Cross cost-based plans. The noninsured population (about 5 percent of the total) and all commercial and charge-based Blue Cross coverage are included in the omitted variable CHARGE.[14] We do not consider insurance versus no insurance.

Nonpatient Revenue (E_3)

No variable is specifically included to measure exogenous determinants of nonpatient revenues. Hospitals located in areas with high real per capita incomes are likely to have more ready access to philanthropic capital. Moreover, public expenditures on health and hospitals is a normal good (Vogel and Morrall, 1973). Thus, the variable INC, (real per capita disposable income) embodies nonpatient revenue as well as patient demand effect.[15]

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[14] Given the small percentage of the population without hospital insurance coverage, the variables COST and CHARGE are extremely collinear.

[15] Ginsburg (1970) provides detailed information on nonpatient sources of hospital revenue.

Factor Supply (E_4)

Several variables describe the attractiveness of the hospital's environment to professional nurses. The Survey of Hospital Directors of Nursing asked hospital respondents to rate the hospital's parking facilities in terms of safety. The variable SAFE (= 1 if the facilities are only "moderately safe" or "unsafe") is a measure of crimes against persons in the hospital's immediate vicinity. The variables RAPE and AUTO are measures of violent crimes against women and property (defined, respectively, as the number of forcible rapes and auto thefts per 100,000 State population). Professional nurses who are white and from middle-class origins may be reluctant to work in poverty areas or in areas where blacks constitute an important proportion of the population. Moreover, they may not want to live near such areas, which means the transportation costs may be higher. The variables BLK and HDENS measure the percentage of the population that is black and the percentage of families living in housing with 2.5 or more persons per room—both are defined for the hospital's zip code area for hospitals in SMSAs and for the county for hospitals outside SMSAs. Holding other factors constant, warm climates may be preferred to cold, and for health reasons, high pollution areas are seen as unattractive. Measures of these factors are TEMP, the mean January temperature in the State's largest city and SUSP, the mean suspended particulate matter levels in the nearest city for which data are available. Finally, we use EXP, real per capita State-local expenditures per State, to reflect relative investments in health services and schools, which nurses may value highly (given their comparatively high level of education).

It must be emphasized that some of the variables discussed as "preference-production" and "demand" variables can also be interpreted as factor-supply variables. The most important of these are the nursing school (NURSH) and urban (URB) variables.

The most relied-upon policy instrument for affecting the supply of professional nurses, both in the aggregate and in geographic distribution terms, is public expenditures on nurse training. The rationale given at both Federal and State legislative levels is that nurses who receive their training in a given area are likely to remain there. This reasoning implicitly places an important weight on the transactions costs of moving (either psychological reasons or the direct financial outlays themselves) and/or legal restrictions (such as licensure) that impede movement. Although references to retention probabilities (from nursing school to work) are often cited as evidence, they do not tell the whole story, since higher proportions of "home-grown" nurses

may effectively discourage immigration of nurses from other areas.[16] However, if on the whole, the pool of potential migrants is comparatively small because nurses are immobile, a locality may successfully increase its pool of nurses by means of training. According to an American Nurses' Association publication (1974), most States offer reciprocity to nurses from other States; thus, licensure per se is probably not an important barrier to mobility. Our measure of nurse training is NSTU, the ratio of graduates of nursing schools per 10,000 State population. We have selected a State training measure because nursing students are eligible for State-subsidized education throughout the State in which they claim residence.

Although the percentage of hospital employees covered by collective bargaining agreements remains small in absolute terms, coverage has risen substantially in some geographic areas. Almost 12 percent of hospital respondents to our survey had agreements covering professional nurses in 1973. Changes in the Taft-Hartley law enacted during 1974, which require voluntary hospital employers to recognize collective bargaining units chosen by hospital employees, may be expected to substantially increase unionization of virtually all labor categories within the hospital.

The potential effects of unions depend on their objectives and constraints as well as their relative power vis-à-vis the hospital(s). Given that the question of union objectives has been debated for decades without resolution (Dunlop, 1944; Atherton, 1973; and Ross, 1948), we cannot expect to approach a new collective bargaining setting—a sector dominated by nonprofit institutions and involving professional as opposed to nonprofessional workers—with a great deal of certainty.[17]

These are, potentially, three not mutually exclusive impacts of hospital collective bargaining agreements that may affect RN staffing (and wages). These effects could:

1. Offset the hospital's monopsony power, with a resultant increase in both professional nurse employment and wages;
2. Raise professional nurse wages, creating a temporary disequilibrium gap, which would be eventually closed by hiring freezes and the like; [18] and
3. In bargaining for better working conditions for professional nurses and/or for improvements in the quality of nursing service, affect the hospital's production function constraint

[16] Retention rates are presented in Sloan (1975) and in chapter 4 of this volume.

[17] Probably the best study on collective bargaining in the nonprofit sector is Bunker (1973).

[18] This seems to us to be the most likely rationing process for hospitals. Reder (1959) discusses rationing of employee positions.

with the result that professional nurse employment rises. Wages might also increase (as an indirect effect).[19]

Since hospital unions are less prevalent in nonmetropolitan areas, where hospital monopsony power is likely to exist at the individual hospital level, it is doubtful there would be a positive impact of unions on professional nurse employment and wages for the first reason, but the third reason could produce the same empirical result.[20] Our variable UNION (= 1 if the hospital has a collective bargaining unit covering professional nurses) only refers to professional nurses. In preliminary regressions, we attempted to isolate union "threat" effects, but without success.

In our study, we test for monopsony effects on staffing with the variable MON—the hospital's beds as a percentage of all short stay hospital beds in the country.[21] The monopsony issue will be considered in far greater detail in chapter 3.

Prices of Other Inputs (r)

Only Ehrenberg (1974) has dealt explicitly with the impact of non-RN wages on RN staffing. In that study, the dependent variable was the ratio of full-time RN equivalents employed by the hospital to full-time equivalent (FTE) LPNs employed by the hospital. One of the explanatory variables was the annual payroll cost per FTE professional nurse divided by the annual payroll cost per FTE licensed practical nurse. As can be easily shown (a point Ehrenberg recognized), this method for constructing the relative wage variable introduces errors in variables; and the resulting bias may cause a negative wage coefficient even if the true coefficient were zero. Since a major objective of Ehrenberg's study was to ascertain whether hospitals are in fact cost-minimizers, which is indicated if the relative wage coefficient is negative, the bias is rather unfortunate. Little confidence can therefore be placed in the negative coefficient Ehrenberg reports.

In our study, wage data for non-RNs from the 1970 U.S. Census, updated to 1974 using Bureau of Labor Statistics hospital wage surveys, have been merged with our survey of hospitals. Our measures are WAGE2, real hourly wages of hospital LPNs, aides and orderlies, and WAGE3, real hourly wages of other

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[19] These results may be derived from a simplified two-factor, one-product model with quality excluded.

[20] The third reason belongs on the demand side; since two out of the three causal mechanisms relate to the supply side, we include unionism under E, for purposes of exposition. Collusion among hospitals within an area in wage-setting cannot be ruled out. In this sense, unions could offset monopsony power in highly urbanized areas as well.

[21] We also considered variables based on RN employment. But in counties where the hospital accounts for a large share of hospital employment, any error in the denominator of the monopsony variable would be common to the dependent variable as well. An error might arise, for example, if the hospital temporarily deviated from what it considered to be its optimal RN employment level.

non-RN personnel, including hospital clerical, labor, and service employees. In terms of mean percentages of the hospital's total wage bill, the latter is 2.2 times more important than the former labor category. We also included a measure of real wages of other hospital professional and managerial personnel in preliminary regressions; this variable, however, proved to be insignificant and highly collinear with the other wage variables.

It is reasonable to expect that some of the "amenity" variables listed earlier are also sources of wage differentials for non-RNs. With both "amenity" and non-RN wages included together in a professional nurse staffing regression, we are measuring amenity effects not captured by non-RN wages. To the extent that RN and non-RN preferences differ, one would expect to observe independent amenity effects on RN staffing and real RN wages.

Regulation

The rapid rise in hospital expenditures has led to a plethora of controls in an effort to temper the rate of expenditure increase. There has been a regrettable lack of systematic research on the probable consequences of specific control mechanisms, and it is only very recently that possible impacts are beginning to be assessed. Probably the two most potentially important regulatory mechanisms to arise in recent years are certificate-of-need laws (CN) and prospective reimbursement (PR).

Under CN, a local planning agency has the right to place legal restrictions on capital investments deemed unnecessary and to prevent the hospital from receiving capital and operating revenues relating to unapproved projects. According to Lewin and Associates (1974), 24 States have such laws and, at the time of the Lewin study, seven other States were contemplating such legislation.

Some States require prior planning agency approval for new bed construction and major equipment purchases above stated minimums, while others are limited to bed construction (Havighurst, 1974). The National Health Planning and Development Act of 1974, which requires all States to enact CN statutes, has given this type of control additional impetus. Conceptually, CN controls the levels of high unit cost inputs. In the process of hospitals' remaximizing, it is not surprising to find compensatory responses to such restraints.

An analysis by Salkever and Bice (1976) indicated that while CN has decreased bed construction, assets per bed have increased, presumably on types of equipment not subject to regulation *and* on regulated items during the "grace" periods such laws tend to provide. The hospital's use of labor inputs is assumed to

be likewise affected by CN. The variable CN1 and CN2 identify, respectively, States with CN prior to 1972 and those with laws implemented during 1972–73.[22]

In principle, PR is a method for paying hospitals according to "fee schedules" fixed prior to the start of the year to which they apply. After a set period, the schedules may be revalued according to a formula, budget review, or negotiation (Dowling, 1974). Aside from this feature, there is considerable variation in PR in terms of the number of insurance programs covered, the methods for setting rates, and whether the hospital's participation in PR is compulsory or voluntary. As of 1973, only New Jersey and New York had mandatory PR programs for both Medicaid and Blue Cross plans. If PR has any impact at all, it is likely to have an effect in these two States because of their programs' relatively broad coverage and mandatory nature. Hospitals in these States are identified in our analysis by the variable PR.[23]

While it seems plausible from program descriptions that the prospective rates are not exogenous to the hospital in practice, only Worthington (1976), in a study of New Jersey PR where almost all hospital rates are set in advance by a budget review, presents empirical evidence. Worthington's regressions indicate that in 1972–73, a New Jersey hospital whose costs exceeded its per diem prospective rate in year t would be awarded a $.50 increase in the t + 1 per diem rate for each $1.00 of difference between the prospective rate established for t and its realized cost per diem in t. By comparison, under pure retrospective incurred cost-based reimbursement, the award would have been $1.00. The true prevalence of pure retrospective plans, however, now or in the past, is unfortunately unknown.

Empirical Results

For purposes of the regression analysis, all continuous variables are in log form, and all binary variables are linear. Expressed in this form, all continuous variable parameters have the constant elasticity property.

Table 2 gives concise definitions of the variables. Professional nurse staffing regressions are presented in table 3. Earlier, we defined 29 variables. For reasons of multicollinearity, we have limited the number of included variables at any one time to a maximum of 20. The parameter estimates are reasonably insensitive to specification changes in the range of variables included in table 3. Variables included in all regressions are the ones for which the theoretical justification is the strongest and are, in our

[22] We thank David Salkever for providing the data on CN.

[23] The New Jersey and New York programs are described in detail in Bauer and Clark (1974a, 1974b).

Table 2.—Concise definitions of nurse staffing regression variables

Variable	Definition
H	Hospital's RN employment expressed as full-time equivalent hours
HB	H divided by hospital beds
MEDSC	Hospital part of university medical school complex
NURSC	Hospital affiliated with nursing school
MEDSA	Hospital affiliated with medical school but not part of a university medical school complex
VOLUN	Voluntary hospital
PROPRI	Proprietary hospital
INC	Real per capita disposable income
PHYSG	General practitioners per 10,000 population
MD	Physicians per 10,000 population
PHYSP	Specialist physicians per 10,000 population
COST	Percentage of potential patients with cost-based hospital insurance
SICK	Disability days per 1,000 persons aged 15 to 65
ELD	Percentage of population aged 65 and over
URB	Percentage of population living in urban areas
OBEDS	Beds in "other" short-stay hospitals per 10,000 population
SAFE	Hospital's parking lot *only* "moderately safe" or "unsafe"
BLK	Percentage of population that is black
HDENS	Percentage of families living in housing with 2.5+ persons per room
TEMP	Mean January temperature
SUSP	Suspended particulate matter
RAPE	Rapes per 100,000 State population
AUTO	Auto thefts per 100,000 State population
EXP	State and local government expenditures per 10,000 population
NSTU	Graduates of nursing schools per 10,000 State population
UNION	Hospital has collective bargaining agreement covering RNs
MON	Hospital's beds as percentage of all short-stay beds in county
WAGE1	Real RN starting monthly salary—diploma, full-time at hospital; no experience elsewhere
WAGE2	Real LPN-aide-orderly hourly salary
WAGE3	Real hourly salary—clerical, labor, service employees
CN1	State had certificate-of-need before 1972
CN2	State instituted certificate-of-need during 1972–73
PR	Identifies New Jersey and New York prospective reimbursement plans
BEDS	Number of beds in hospital
DFL1	State price index
DFL2	Area price index

judgment, the best measured. In most cases, we give partial correlations for excluded variables (in parentheses when no parameter estimate is given).

As noted, we have experimented with two cost-of-living deflators. In general, regressions using the State price index (DFL)

Table 3.—Nurse staffing regressions

Explanatory variable	Dependent variable				
	1.H	2.HB	3.H	4.H [1]	5.HB
MEDSC	—	—	—	—	0.057
	(0.02)	(0.04)	(0.02)	(0.03)	(0.087)
NURSC	[2] 0.165	[2] 0.204	[2] 0.157	[2] 0.163	[2] 0.158
	(0.053)	(0.044)	(0.053)	(0.052)	(0.046)
MEDSA	—	—	—	—	0.069
	(0.03)	(0.03)	(0.03)	(0.03)	(0.068)
VOLUN	0.071	0.072	0.068	0.082	0.075
	(0.042)	(0.042)	(0.043)	(0.043)	(0.044)
PROPRI	−0.102	−0.119	−0.110	−0.111	−0.107
	(0.070)	(0.068)	(0.070)	(0.069)	(0.071)
INC	0.179	0.180	0.177	0.143	[3] 0.231
	(0.112)	(0.111)	(0.112)	(0.110)	(0.105)
PHYSG	[2] 0.102	[2] 0.095	[2] 0.103	[2] 0.108	[2] 0.116
	(0.034)	(0.033)	(0.034)	(0.034)	(0.033)
PHYSP	[2] 0.052	[2] 0.053	[2] 0.051	[2] 0.052	[2] 0.052
	(0.012)	(0.011)	(0.012)	(0.012)	(0.012)
COST	[3] 0.071	[3] 0.077	0.062	[2] 0.083	[3] 0.074
	(0.032)	(0.032)	(0.033)	(0.032)	(0.030)
SICK	[2] −0.242	[2] −0.265	[3] −0.222	[2] −0.234	[2] −0.302
	(0.091)	(0.090)	(0.094)	(0.091)	(0.088)
ELD	[2] −0.348	[2] −0.347	[2] −0.342	[2] −0.367	[2] −0.267
	(0.064)	(0.064)	(0.065)	(0.062)	(0.062)
URB	—	—	—	—	−0.002
	(0.00)	(0.01)	(0.01)	(0.01)	(0.007)
OBEDS	—	—	—	—	0.0006
	(0.00)	(−0.01)	(0.00)	(−0.00)	(0.011)
SAFE	0.041	0.049	0.041	—	—
	(0.041)	(0.041)	(0.041)	(0.04)	(-)
BLK	[3] −0.0122	[3] −0.0114	[2] −0.0130	[2] −0.0137	—
	(0.0047)	(0.0046)	(0.0048)	(0.0048)	(-)
HDENS	−0.030	−0.032	−0.031	−0.026	—
	(0.025)	(0.025)	(0.026)	(0.026)	(-)
TEMP	[2] −0.038	[2] −0.038	[2] −0.040	[2] −0.033	—
	(0.013)	(0.012)	(0.013)	(0.013)	(-)
SUSP	−0.056	−0.048	−0.048	—	—
	(0.034)	(0.033)	(0.035)	(−0.04)	(-)
RAPE	—	—	—	—	—
	(0.03)	(0.03)	(0.03)	(0.02)	(-)
AUTO	—	—	—	—	—
	(0.04)	(0.04)	(0.04)	(0.03)	(-)
EXP	—	—	—	—	—
	(0.03)	(0.03)	(0.02)	(0.01)	(-)
NSTU	[3] 0.135	0.128	0.117	0.123	—
	(0.069)	(0.069)	(0.070)	(0.069)	(-)
UNION	—	—	—	—	—
	(0.02)	(0.02)	(0.01)	(0.02)	(-)
MON	—	—	—	—	—
	(0.02)	(0.04)	(0.01)	(0.03)	(-)

Table 3.—Nurse staffing regressions—Continued

Explanatory variable	Dependent variable				
	1.H	2.HB	3.H	4.H [1]	5.HB
WAGE1	—	—	—	—	−0.241
	(–)	(–)	(–)	(–)	(0.147)
WAGE2	0.259	0.265	0.247	0.260	0.211
	(0.181)	(0.181)	(0.182)	(0.184)	(0.182)
WAGE3	[2] 0.416	[2] 0.425	[2] 0.407	0.280	[2] 0.587
	(0.214)	(0.210)	(0.214)	(0.205)	(0.217)
CN1	—	—	0.092	—	—
	(–)	(–)	(0.085)	(–)	(–)
CN2	—	—	0.062	—	—
	(–)	(–)	(0.049)	(–)	(–)
PR	—	—		—	—
	(–)	(–)		(–)	(–)
BEDS	[2] 1.035	—	[2] 1.035	[2] 1.030	—
	(0.029)	(–)	(0.029)	(0.028)	(–)
CONSTANT	−0.027	0.125	−0.056	0.174	0.954
	(–)	(–)	(–)	(–)	(–)
	R^2=0.91	R^2=0.42	R^2=0.91	R^2=0.91	R^2=0.39
	F(18,484)	F(17,487)	F(20,482)	F(16,488)	F(16,490)
	=[2] 277.1	=[2] 20.3	=[2] 249.6	=[2] 307.4	=[2] 19.7

[1] Uses DFL2. See table 2.
[2] Significant at the 1-percent level.
[3] Significant at the 5-percent level.
Note: Numbers in parentheses are standard errors when there is a parameter estimate; otherwise they are partial correlations.

give a slightly better fit than those based on an index that permits intrastate variation in prices (DFL2). In general, the staffing results are insensitive to our choice of deflator. All regressions use DFL1 except the fourth, which is presented to show the few differences that do emerge when DFL2 is used. The fifth regression is based on the assumption of a competitive market for professional nursing services. The professional nurse wage (WAGE1) is included, and, as appropriate for a competitive market, factor-supply variables are excluded. The parameter estimate of the BEDS parameter is essentially unity. Thus, except for the change in the R^2, it makes little difference which dependent variable is used. The variants, including BEDS as an explanatory variable, are not necessarily better. The higher R^2s reflect the fact that the BEDS variable picks up hospital size.

Of the preference-production function variables, the NURSC coefficient indicates higher professional nurse staffing in nursing school affiliated hospitals. The pattern by hospital ownership shows voluntary hospitals have the highest levels of staffing and the proprietaries the lowest. These differences may be due to

voluntary hospitals' preferences for more quantity and/or quality than the profit-oriented institutions. Alternatively, there may be organizational slack in nonprofit hospitals, or such hospitals may be allocatively inefficient, as Bays (mimeo.) claims. Our results are far from sufficient to support any of these arguments. Affiliation with medical training programs appears to have little impact on professional nurse staffing.

The parameter estimates of income (INC), the physician-population ratios (PHYSG and PHYSP) and cost-based reimbursement (COST) are all positive and significant at the 5-percent level or better in most cases. From the INC coefficients, one may infer that part of the observed spatial variation in professional nurse staffing stems from differences in patients' ability to pay for professional nurse-intensive services and/or from geographic differences in the availability of philanthropic or Government capital and operating funds for such services. In regressions based on our survey with LPN and aide-orderly staffing as dependent variables (not shown in this study), INC's parameter estimates are consistently negative. This evidence tends to support the view that more professional nurses are used in the process of purchasing higher quality levels of hospital service.

The higher elasticity for general practitioners (PHYSG) than for specialists (PHYSP) is somewhat surprising, particularly in view of Feldstein's (1971) finding that demand for hospital services is lower in States where general practitioners (GPs) are relatively more numerous. But, since specialists outnumber GPs about three to one [Roback (1975)], the marginal impact on RN staffing from a unit change in specialists per 10,000 population exceeds the marginal impact from a comparable change in the GP-population ratio. The physician parameter estimates establish important links between manpower policies that affect physician location and professional nurse staffing.

The COST parameter estimates are positive and, with one exception, significant at the 5-percent level or better. Using the sample mean for COST—28.2 percent—and the table 3 COST elasticities, nurse staffing is predicted to rise from 22 to 30 percent on the average if cost-based reimbursement were extended to the entire United States population under a national health insurance plan.

The health variables SICK and ELD have negative coefficients and are always statistically significant at conventional levels. The negative signs may reflect longer lengths of stay in less healthy populations. Hospital stays are less professional nurse-intensive after the first few days, since special services using

substantial amounts of professional nursing inputs are usually consumed early in hospital stay.

With one exception, the urban (URB) and other beds in county (OBEDS) variables have been excluded from the staffing regressions. Judging from the partial correlations, it is clear these variables make virtually no contribution, once a number of other variables have been included.[24] The poor results for OBEDS may imply that hospitals are truly monopolists in their product market—or, at the other extreme, that they compete in a market area much larger than the county—and OBEDS should have been defined for a larger geographic unit.

Factor-supply variables SAFE, BLK, HDENS, TEMP, SUSP, RAPE, AUTO, and EXP measure the relative attractiveness of the geographic area in which the hospital is located. Of these, the first four have the strongest rationale for inclusion and are the best measured. Although SAFE's coefficient generally exceeds its standard error, the coefficient's sign is implausible. The parameter estimates of the black population percentage (BLK) and the housing density variable have plausible negative signs, implying hospitals in these areas have less attractive environments. The temperature and pollution coefficients (TEMP and SUSP) suggest RNs prefer warm and pollution-free areas.[25] Variables RAPE, AUTO, and EXP are unfortunately defined for the hospital's State rather than a smaller geographic unit. Judging from the partial correlations, it is evident these variables make only a small contribution, given the other variables in the staffing regressions.[26]

The nursing school graduating class size (NSTU) coefficient is significantly positive in one regression and nearly so in the others. The NSTU elasticity implies a doubling of class sizes in a State would lead, on the average, to a 15- to 20-percent increase in nurse staffing in hospitals located in that State. This result has important policy implications that we explore in the next section. In preliminary regressions, neither bargaining (UNION) nor the monopsony measure (MON) demonstrated any relationship with nurse staffing. They have therefore been excluded from the staffing regressions presented in table 3.

The cross-wage terms (WAGE2 and WAGE3) have plausible, positive impacts on nurse staffing. Although there is no statistical evidence from past studies, it is reasonable to expect the elasticity of substitution between RNs and LPN-aide-orderly

[24] These variables' simple correlations with the staffing dependent variables range from +0.20 to +0.43.

[25] The wage regressions do not fully confirm this result; see the discussion in chapter 3.

[26] The simple correlations between these variables and the dependent variables are much higher (by about a factor of 10).

category (represented by WAGE2) to exceed the substitution elasticity between RNs and hospital clerical-labor-service workers. But, as noted before, the latter group represents a much higher proportion of the mean hospital's wage bill. Since the degree of responsiveness of RN staffing to wages of other personnel may be expected to rise with the substitution elasticity *and* the proportion, it is not clear *a priori* (even from a highly simplified hospital model) which of the two cross-wage elasticities should be larger. Given that the proportions are known, and given the parameter estimates from table 3, one may infer that the RN-LPN-aide-orderly substitution elasticity is slightly higher. In the fourth regression, the WAGE3 coefficient falls dramatically with a change in the cost-of-living deflator. However, the COST coefficient rises. Our estimates in these cases are somewhat sensitive to the choice among (admittedly imperfect) deflators.

The fifth regression's specification is appropriate under the assumption that the market for professional nursing services is competitive. On goodness-of-fit criteria, this regression is almost as good as the second regression, which has the same dependent variable but contains RN factor-supply variables. This result per se does not enable us to determine whether the RN market is perfectly or imperfectly competitive; the WAGE1 variable could incorporate the effects of exogenous forces on the RN-supply side, which are represented explicitly in the other regressions. The fifth regression, like the others, does imply that a constrained maximization model is appropriate for analyzing hospital input decisions. These results support Ehrenberg's (1974) argument much more strongly than Ehrenberg's own evidence.

The certificate-of-need variables (CN1 and CN2) enter the third regression; the coefficients are positive and exceed their standard errors but are insignificant at conventional levels. Prospective reimbursement (PR) enters several regressions, but does not perform well in any of them.[27] These results are very tentative. Further work on this topic is needed, and an important extension would be to gauge regulation's impact using a time series of cross sections (including observations on hospitals before and after the regulatory device was instituted) in order to verify that the regulation variables measure regulation as opposed to unspecified State effects.

Conclusions and Policy Implications

We have made an empirical assessment of the forces underly-

[27] The variable PR is excluded from all regressions presented in table 3.

ing professional nurse staffing in hospitals. Subject to the caveats mentioned earlier, our summary findings and the policy implications that these findings support are several.

Even a cursory examination of nurse-population ratios by State reveals a substantial amount of interstate variation in professional nurse-population ratios. But if one adds other types of nursing personnel—LPNs and aides-orderlies—to professional nurses and examines the resulting ratios, interstate variation almost disappears. Clearly, employers of nursing personnel substitute less skilled personnel for professional nurses in geographic areas in which professional nurses are relatively scarce. Hospitals located in geographic areas where the price of less skilled personnel is comparatively low and/or in which recruitment of RNs is difficult have in fact substituted such personnel for professional nurses. This finding does not imply that this is necessarily desirable; it can only be said that hospitals, facing budgetary limitations and given the relative costs of obtaining various kinds of personnel, have been willing to make this kind of substitution.

The principal instrument for affecting the distribution of nurses has been nurse training. Our results demonstrate that expansion of nurse training may be successfully used to increase the availability of nurses in geographic areas where such increases are desired. Our RN wage study in chapter 3 shows RN wages are lower in States with extensive nurse training facilities. Expansion of nurse training facilities raises the nurse student population with previous attachment to the State; many of these students decide to locate in the State upon graduation, even if they can earn less there. According to Sloan (1975), the probability that a nurse will remain in the State where he/she trained is high, at least for the first position in nursing. Viewed over the life cycle, the retention rate is much lower, but nevertheless substantial. A second empirical issue relates to the number of nurses who would have otherwise entered the State as practicing nurses, had there been fewer domestic (in State) graduates. No *direct* empirical evidence is available on this issue. Our nurse training parameter estimates incorporate both the retention and inmigration effects. Although retention and inmigration are not directly observable, it can be said that if inmigration is reduced by expanding domestic training, it is more than offset by retention of greater numbers of in-State graduates. Our analysis offers no new information on the relative merits of nurse training versus measures to boost the labor force participation rate of the existing pool of nurses. But in combination with results to be presented, nurse training appears

to be a far surer way to assure an adequate pool of nurses in a given geographic area than are other types of incentives we shall consider.

We have presented evidence that the community physician-population ratio has a positive impact on nurse staffing in hospitals in the same community. Policies to affect the spatial distribution of physicians affect the spatial distribution of professional nurses indirectly via the effects physician availability have on the use of hospital services. Policymakers have become increasingly aware that financial support of medical education has implications beyond the provision of physicians' services per se. The findings of this study are consistent with this awareness. In forecasting the supply of nurses in a particular location, one must take into account the interactions between nurse location and the location of the physicians.

Legislation frequently requires that executive branch agencies designate those geographic areas experiencing various types of manpower "shortage" and that public funds be spent in such areas to alleviate the shortage. Although the term shortage means many things to many people (Blair and Sloan, 1975), one plausible interpretation is the levels of earnings required by the professional nurse to work in certain areas is usually high, because they find them to be relatively unattractive locations in which to work and live. Several factor-supply variables describing the hospital's location have been included in our empirical analysis. Of these, the most precise relationships pertain to hospital location in inner-city areas. If increased nurse staffing in such areas is desired, it will be necessary to offer compensating incentives. If shortage is to mean unusually low manpower-population ratios, as it generally does in policy discussions, one must, of course, refer to exogenous sources of variation on the product-demand, including ability to pay, as well as the factor-supply side.

The performance of personal per capita income, one of the product-demand variables, clearly supports the notion that at least part of the spatial variation in professional nurse staffing is due to differences in communities' ability to pay for kinds of hospital services that happen to be professional nurse-intensive. In past research on nurse staffing (Levine and Phillip, 1975) and in several studies of hospital costs, researchers have taken special care to specify explanatory variables relating to hospital case mix. However, such variables as case mix and style of care are themselves endogenous to the hospital sector and dependent on income and other factors. Considering case mix and style of care variables as exogenous probably leads to an understate-

ment of income's effect. Many policy discussions imply that supply-side factors reflecting the attractiveness of particular locations are principally responsible for marked spatial disparities in nurse-population ratios; it is inappropriate to place all blame on the supply side. Our findings attribute some of the variation we are able to explain to such demand-side factors as income.

Traditionally, there have been wide regional disparities in income and wealth. The South in particular has lagged behind other regions in terms of economic growth. Since 1970, or thereabouts, there have been marked changes in relative rates of income and population growth. Reversing post trends, the South on the whole now leads in rates of growth. The empirical results reported here imply regional disparities in nurse availability will tend to narrow as interregional differences in wealth narrow. In this sense, the maldistribution of nurses will at least *partially* solve itself. This is not to say nurse availability will become adequate in all areas; nor do we wish to minimize the importance of Government's role in this field. Certainly, Government's responsibility in identifying areas that professional nurses find particularly unattractive locations in which to work and live will continue. The development of effective offsetting or compensating incentives is, however, as frequently stressed in this study, no easy matter.

With the probable enactment of some form of national health insurance (NHI) in the future, there is widespread interest about the effect of extending coverage to previously uninsured segments of society, and about the consequence of specific provisions of such plans. Since NHI's potential for extending coverage to persons previously without hospital insurance is very small (Newhouse, *et al.*, 1974), attention—as far as the hospital sector is concerned—is appropriately focused on the effects of specific NHI provisions. The conceptual analysis of the comparative impacts of cost- versus charge-based reimbursement is complex. Ultimately, the issue of the relative effects must be decided empirically. Our results imply cost-based reimbursement induces hospitals to use skilled inputs such as professional nurses in greater amounts; and our results are clearer in this regard than Davis' (1973). In contrast, however, Salkever (1972) reported that commercial insurance, which is only very rarely cost-based, is on balance more inflationary. These conflicting results suggest an unmistakable need for more empirical research on this important issue.

This chapter has included a preliminary assessment of union and monopsony impacts on professional nurse staffing in hospitals. In both instances, essentially no effect is detected. However,

both unionization and monopsony impacts are analyzed in greater depth in chapter 3. Likewise, we have attempted to isolate employment effects associated with two regulatory devices, certificate-of-need and prospective reimbursement. Neither appears to be important in terms of professional nurse staffing. Since 1973, the year of the Survey of Hospital Directors of Nursing, was a time during which States were just beginning to implement these regulatory programs on a large-scale basis, employment effects should be reassessed using data for more recent years.

Again, although differences between nonprofit and for-profit hospitals are frequently emphasized, our results do not indicate different behavior in terms of professional nurse staffing. In chapter 3, we assess another possible form of for-profit/nonprofit differences, the "philanthropic wage hypothesis." Hospitals affiliated with schools of nursing have higher levels of nurse staffing. Medical school affiliation, however, has no impact per se on the number of nurses employed. To the extent possible, it is important to consider differences in hospital mix when making interarea comparisons of nurse availability. Sometimes the distribution of hospitals by type of hospital affects nurse employment, as in the case of hospitals affiliated with nursing schools, but at the same time, these differences are not directly responsible for meaningful interarea variation in patient access to nursing services.

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Chapter 3

PROFESSIONAL NURSE WAGE-SETTING IN HOSPITALS

Frank A. Sloan
and
Richard A. Elnicki

Introduction

In this chapter we analyze the determinants of compensation levels for professional nurses with particular reference to wages, using the basic framework developed in chapter 2. Not only may wages potentially affect a nurse's choice of employer, but research on other aspects of nurse supply—especially nurse labor force participation, weeks worked per year, and hours worked per week—indicate wages are an important supply determinant in these areas. Empirical evidence of wages' impact on the nurse's choice of employer is far less certain. It is possible more conclusive evidence will be obtained once more precise measures of earning opportunities in alternative employment settings are available.

Although this chapter has important implications for policies specifically concerned with the spatial distribution of professional nurses, it also relates to policies aimed at tempering the rise in hospital costs. During the past decade, costs per patient day have risen at an annual rate exceeding 10 percent. Although most empirical research on hospital costs has described changes in the components of hospital costs or has assessed the extent of economics of scale in hospitals, few studies have analyzed the behavioral forces underlying changes in the quantities of inputs used to produce hospital services and their prices. A prerequisite for the formulation of effective hospital cost-control policies is an understanding of the nature of these behavioral forces.

Policies of the Federal Government have several potential effects on professional nurses' compensation that need to be examined. One such policy is the loan-forgiveness program that has been used by the Department of Health, Education, and Welfare as a method for inducing nurses to locate in "underserved" areas. As shown in appendix B, wages expressed in real terms are about the same in hospitals with and without the special loan forgiveness designation, although in some respects

loan-forgiveness hospitals have better offerings than others. One important objective of the analysis of professional nurse compensation at the outset was to determine whether hospitals eligible for a special loan-forgiveness designation offer lower wages to professional nurses as a result. If this proved to be the case, the potential effectiveness of loan forgiveness could be reduced, or, for that matter, could be almost totally offset. On further reflection, it was determined that an assessment of the loan-forgiveness program might not be adequately performed with a single cross section, because the loan-forgiveness designation, at the time the data were collected, was primarily a function of a hospital's professional nurse staffing levels. In other words, the designation is itself a function of one of our model's dependent variables. However, the potential impacts of other policies on wages, such as those relative to regulation and unionization, can be evaluated.

It has been alleged by Yett (1970) and others that hospitals exercise monopsony power in the market for professional nurses' services; and it has been noted that nurses are frequently "secondary wage earners," a factor tending to limit their geographic mobility and, hence, to reduce the elasticity of nurse supply in many market areas. Since nursing is a skilled occupation, the possibilities for substituting other types of personnel for nurses are limited. Moreover, over 70 percent of U.S. hospitals are located in one-hospital communities (Baird, 1969). The presence of several hospitals within a community tends to make it more difficult for hospitals to exercise monopsony power, although, as with substitution, collusion among hospitals in the interests of depressing nurse compensation levels is not impossible.

While the issue of whether or not hospitals exercise monopsony power may appear to merit interest from a scholarly perspective, it may seem to have few implications for public policy. This, however, is by no means the case. First, the presence of a monopsony has been used to explain vacant nursing positions in hospitals (Yett, 1970; Altman, 1971). If these vacancies reflect the use of monopsony power, they do not merit attention by policymakers as indicators of a nursing "shortage"; as can be demonstrated theoretically, a monopsonistic employer will hire fewer employees and offer them a lower level of compensation. If hospitals in isolated areas are often in fact monopsonists, lower professional nurse staffing ratios in such areas may be at least partially due to the exercise of monopsony power. The valid question for policymakers to raise is whether it is desirable to assist hospitals in recruiting and retaining nurses if, in fact, their apparently low staffing ratios are the result of a deliberate decision on

their part to, in effect, exploit nurses so as to generate cash flow to serve other objectives of the hospital.

In order to examine this and related points, it is worth reviewing some economic theory. In order for hospitals to be monopsonists (or oligopsonists), they must individually face an upward-sloping labor supply curve in contrast to the horizontal supply curve facing individual employers in competitive labor markets. In a competitive market, the change in the employer's total personnel cost when a unit of labor is added is the wage paid that unit. In such markets the employer can obtain as many units of labor as he desires at the "going" (or competitive) wage. In monopsonistic (or oligopsonistic) markets, the employer must pay higher wages to attract more labor units; moreover, he must give existing workers the same wage as he pays the newly hired worker. Therefo[illegible]not only does the employer face the cost of the wage paid to additional workers, but also the raises he must pay existing employees. The change in total personnel costs per additional worker (or unit of labor) hired is called the marginal factor cost (MFC). According to economic theory, the profit-maximizing firm in the position of a monopsonist would hire the number of workers at the point where the MFC equals labor's marginal revenue product (MRP), the firm's demand curve for labor. If the employer is a perfect competitor in the market for inputs, the wage equals the MFC. Although these concepts have been developed for profit-maximizing firms, they apply as well to hospitals with the objective function specified in chapter 2.

Referring to figure 1, if hospitals are monopsonists, they will hire Q_1 units of labor at wage W_1. However, if asked how many units they would hire at W_1, they would answer Q_2. The difference

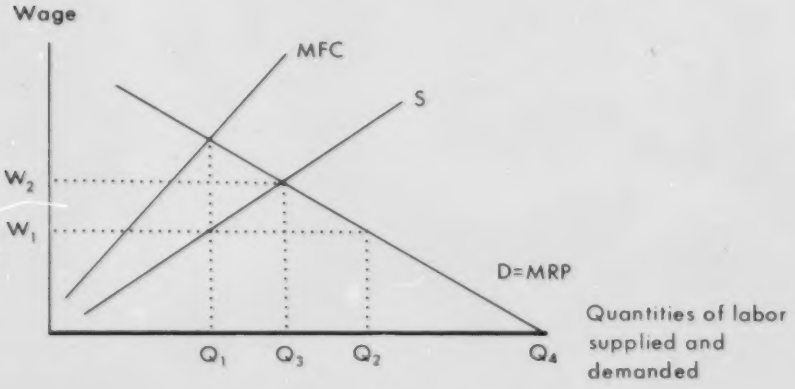

Figure 1.—Employment and vacancies: The monopsonist case.

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Q_2–Q_1 represents "equilibrium vacancies." If a labor union successfully bargained with the hospital, it might force wages up to W_2, the maximum the hospital would ever pay. In this case, Q_3 units would be hired at a wage of W_2. If the wage were set at W_2 by competitive market forces, the hospital would also hire Q_3 units, and the hospital's MFC schedule would correspond to the dotted line emanating from W_2. As seen in figure 1, both Q_3 and W_2 exceed Q_1 and W_1, staffing and wage levels, respectively, in the monopsony case.

As noted in chapter 2, recent changes in the Taft-Hartley law will undoubtedly facilitate the growth of collective bargaining by professional nurses who are employees of not-for-profit hospitals. Unionization and collective negotiations in the determination of salary and other benefits potentially provide a countervailing force to monopsony exploitation by employers. This potential will be evaluated here.

On the other hand, Feldstein (1971) has argued that not-for-profit hospitals pay wages in excess of the level required to obtain the number of employees they desire. Rather than exploit employees, according to Feldstein's "philanthropic wage hypothesis," they pay too much. This hypothesis will also be evaluated. The extent of hospital employers' "charitableness" would be of interest to third-party payers, both private and public, who offer cost-based reimbursement.

One of the principal objectives of this study as a whole is to better understand nurses' preferences for various aspects of their jobs. Specifically, what sacrifices in terms of wages are nurses willing to make for improvements in various kinds of fringe benefits, working conditions, and the like? One approach to answering this question is the "hedonic" method. Underlying this method is the assumption that employees' willingness to pay for specific employment-related benefits will be reflected in compensating wage differentials. If employees on the average find a specific benefit, such as free parking or free education, is worth $X per month to them, wages would be $X lower in a setting offering the benefit. According to the hedonic approach, which we use in this chapter, one gauges willingness to pay from the observed wage differentials. Chapters that follow use alternative methods of analyzing the same basic issue. The hedonic method yields similar results with regard to descriptors of the environment surrounding the hospital. For example, if nurses prefer to work in pollution-free settings, this should, in principle, be reflected in terms of observable wage differentials.

There has been a substantial amount of prior research on wage-setting in general and nurse wage-setting in particular

pertinent to our analysis. The second section reviews some important contributions to this literature. The third section presents the basic results of our empirical analysis of professional nurse wages. Relationships between wage and nonwage benefits are considered in the fourth section, and the final section contains our conclusions.

Pertinent Literature

Monopsony

There are essentially two origins of monopsony power, contrived and natural. In the case of contrived monopsonies, employers of specific specialized types of labor make an agreement to purchase such personnel on specific terms and promise not to undercut one another. Examples of contrived monopsonies are found in professional athletics. By contrast, the principal source of natural monopsonies is the immobility of a factor of production. In the present application, the potential source of monopsony power is the professional nurse's immobility. Contrived monopsonies cannot be ruled out in nursing in the cases where hospital employers in a locality form an association to serve their "mutual interests." (This type of arrangement is discussed in Yett, 1970.) Such associations, however, could not succeed were it not for the geographic immobility of many nurses. Before concluding that monopsony situations must be prevalent in nursing, particularly in view of empirical evidence on nurse mobility patterns presented in several places in this volume, it is essential to consider several additional factors.

First, it is *not* necessary for all persons in a labor market to move in response to wage differentials for the labor market to be perfectly competitive rather than monopsonistic. Movement of only some prospective employees is sufficient. For this reason, it is very difficult to establish the existence of monopsony power from data on mobility rates examined in isolation from other evidence. But there is some question whether there are sufficient numbers of prospective nurse employees, willing to move for money, who are able to fill this role. Rather, nurses often move in response to economic incentives offered the spouse. Therefore, mobility rates of nurses per se may overstate the responsiveness of nurses to geographic wage differentials in nursing.

Second, employers are more likely to possess monopsony power in the short term rather than in the long term. Longer periods of time permit persons to search for alternatives in other locations. Moreover, there is greater assurance to prospective employees

that the observed differentials are not very transitory and therefore will persist over a sufficiently long time period to make the move financially attractive. The possibility that hospitals are monopsonists in the short term but not in the long term raises a legitimate question about the "run" that one actually observes in a single cross section, such as the one analyzed in the context of this study. It is quite possible that the inferences about monopsony power one makes from empirical analysis are sensitive to the nature of the data employed.

Third, the slope of the supply curve facing a hospital depends on the responsiveness of nurse hours of work to wages, as well as the responsiveness of geographic movements to financial incentives. To the extent nurse work hours are wage elastic, the slope of the supply curve will be more elastic and the ability of hospitals to exercise monopsony power will be correspondingly less. As indicated in chapter 8, nurse work hours are partially dependent on wage rates offered nurses, although the precise magnitude of the response remains subject to some debate.

There are essentially two ways to assess the existence of a monopsony when a wage rate is the dependent variable. First, product demand variables should demonstrate no impact on wages if the market is both competitive and in equilibrium. If the market has monopsonistic elements, variables hypothesized to have a positive impact on product demand should have a positive impact on wages. The rationale for this test can be seen with reference to figure 1. If the market were competitive, each hospital would face a labor supply curve such as the (horizontal) dotted line emanating from W_2, although the supply curve for the market as a whole would have a positive (upward) slope. Any outward shift in the hospital's demand for labor (MRP) curve would raise employment but would have no impact on wages. However, an outward shift in the demand for labor curve in the monopsony case would raise both employment *and* wages. In terms of figure 1, an outward shift in demand would result in employment and wages greater than Q_1 and W_1. Thus, employment is raised in both competitive and monopsony cases, while wages are only raised in the latter.

While possibly suggestive, this empirical test may not be conclusive for several reasons. For one, given data limitations, the test can really only distinguish labor markets that are competitive on a regional or national basis from monopsonistic markets. Since the product demand variables, such as per capita income, physician availability, and third-party reimbursement are defined on a county basis, the test cannot distinguish between a market that is competitive within a county and a monopsonistic

market. Moreover, this empirical test may not be fully conclusive, because demand variables could show a pattern similar to a monopsony's if the market is in a temporary, competitive disequilibrium.

A second type of empirical test reflects the observation that monopsony is more likely, the more highly concentrated a labor market is on the employers' side. The reason is that collusion among employers is commonly thought to be more difficult in markets where there are numerous individual employers, each providing employment for a small fraction of employees in a given market area. Alternative measures appropriate for the second kind of test will be considered later in the review of previous literature and in discussing our own work.

Four articles within the health services research field deal with the monopsony issue. Hurd (1973) estimated wage regressions for professional nurses, using U.S. Census and Bureau of Labor Statistics data. His wage equation did not contain any product demand variables. Thus, he did not conduct the first test of monopsony power. He did, however, include a measure of employers' concentration—the percentage of non-Federal hospital employment accounted for by the eight largest hospitals in the Standard Metropolitan Statistical Area (SMSA). Hurd's choice of measure was influenced by the fact that his observational unit is the SMSA. Given this observational unit, and since within an SMSA there are surely several potential employers of nurses, the only way that pure monopsony power can be observed is if there are explicit cartel arrangements among employers.

It is, however, possible that employers possess oligopsonistic power. That is, each employer faces an upward-sloping supply curve of labor, but, in addition, the employer must gauge the reaction of other employers to the wage he sets. Under oligopsony, any wage increases on the part of the employer will be met by other employers; but any wage decrease will not be met, and thus will result in a substantial loss of employees to other employers. For this reason, there is a discontinuity (or kink) in the supply of labor curve facing the oligopsonist, located at employment level Q in figure 2. By contrast, the monopsonist, not facing potential reactions from other employers, faces a continuous supply curve, as seen in figure 1. The discontinuity introduces a range of indeterminacy over which product demand can shift without influencing either employment or wages, the strictly vertical portion of the MFC curve in figure 2. As employers become more numerous, the likelihood of oligopsonistic behavior becomes much less. The coefficient of Hurd's concentration ratio variable was negative and statistically significant in all regres-

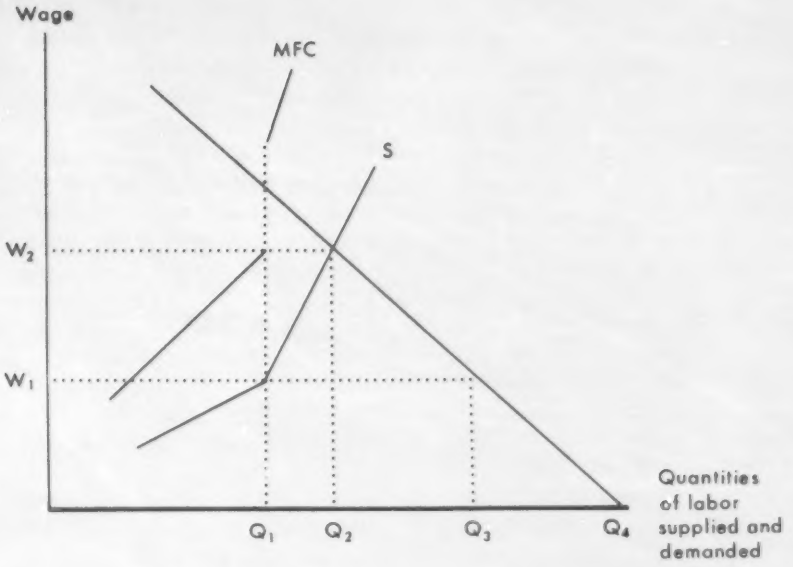

Figure 2.—Employment and vacancies: The oligopsonist case.

sions presented. This evidence supports the argument that there are some noncompetitive elements in the market for professional nursing service.

The evidence on monopsony power presented by Davis (1973) is more indirect. In contrast to Hurd's study, which dealt exclusively with professional nurses, the Davis analysis included all hospital personnel. One may thus have expected from the outset that Davis would have found no evidence of monopsony power, even if it had existed in some occupations. Certainly markets in many lower skilled occupations may be competitive, even if those in the more highly specialized occupations possessed noncompetitive elements. Davis measured monopsony power by the number of hospitals per square mile in the State. Presumably, if hospitals behave as monopsonists, wages will be higher in areas of higher hospital density.

As Davis (p. 198) stated:

> Evidence on the monopsony hypothesis is mixed. Wages are insignificantly related to hospital density when the (hospital) facilities variables are included, but excluding specialized facilities leads to a significantly positive relationship. That is, wages are higher in areas with more hospitals, implying collusive agreements with hospitals either do not exist or break down when there are a large number of hospitals competing for labor. Because of the high correlation between facilities and hospital density, it is difficult to isolate the importance of each issue. Overall explanation is slightly higher when specialized facilities are included.

Since Davis' wage measure—the average wage for the hospital (payroll divided by the total number of employees)—encompassed the skill mix of the hospital's work force, as well as wage rates for each skill level, it is clear that any available and adequate measure of the hospital's case mix should have been included. Given the facilities variables should have been included as explanatory variables—and they were in some variants—the Davis results imply that, *considering all types of personnel together,* hospitals do not possess monopsony power.

The most recent published research on the monopsony issue as it relates to nurses is that of Landon and Link (1975) and Link and Landon (1976). Since both studies used the same data base, and equation specification was similar in many respects, the two studies should be considered together. Landon and Link used data from their own survey of 520 hospitals, which resulted in 317 responses usable for their empirical analysis. Coincidently, the survey was conducted in 1973, the same year as our own Survey of Hospital Directors of Nursing (and our Survey of Registered Nurses). As in our wage analysis, Landon and Link's dependent wage variables were degree and experience specific.

Landon and Link gauged the extent of monopsony power in the market for nurses by including alternative measures of hospital concentration as independent variables in their wage regressions. Their regressions included no demand variables. Thus, as with the other studies we have reviewed, tests for monopsony power were exclusively of the second variety.

Using several alternative measures of concentration, Landon and Link found concentration exerted a significantly negative impact on wages. Empirical results were reasonably consistent, irrespective of the concentration measure and dependent variable employed. Unlike our study, which is based on starting salaries of diploma graduates, theirs presented regressions with beginning salaries of baccalaureate nurses as well as salaries of beginning diploma nurses as dependent variables. Unfortunately, they did not present variable means from their survey. With mean salary data from our Survey of Hospital Directors of Nursing, we estimate that the elasticity associated with Landon and Link concentration index variable is about 0.05.

There is a plethora of studies outside the health field that deal with the monopsony issue. Tests for monopsony power generally involve including various kinds of concentration measures. As a rule, evidence in favor of a monopsony has been found by investigators who have looked for it. (See, for example, Landon and Baird, 1971; Schmenner, 1973; and Ehrenberg and Goldstein, 1975.) Important exceptions are Frey (1975) and Hall and Carroll

(1973). These studies employed a test of essentially the first type and found product demand variables have at best a small input on teachers' salaries.

In the context of another research project we have examined patterns in the concentration measures used by Landon and Link. Our findings have important implications for their studies, in particular, but the results are generalizable to other studies of monopsony power which use concentration measurers. Upon reproducing Landon and Link's concentration measures for SMSAs, we discovered a close relationship between concentration and SMSA size. Concentration in the largest SMSAs is comparatively low; these are also the areas in which wages and prices tend to be relatively high. Especially since Landon and Link did not deflate wages by a local cost-of-living measure, it is quite possible wages are high in the largest SMSAs, not because of low hospital concentration but because of higher cost of living.

Union Effects

Both Davis and Landon, and Link also tested for the impact of unions on wages. The Davis study did not employ a direct measure of unionization at a particular hospital, but instead included variables that describe the impact of a threat of unionization. Citing Miller and Shortell (1969), Davis argued that hospitals located in geographic areas where they are legally required to bargain are more likely to have union contracts. Moreover, she recognized that hospitals located in geographic areas in which a high proportion of the labor force is unionized are more likely to be unionized. Presumably, such areas have a political climate favorable to unions, and persons with the expertise needed to organize workers are more readily available. Variables representing (1) labor laws requiring non-Government, nonprofit hospitals to recognize a collective bargaining unit when a majority of employees of a unit request recognition, and (2) the percent of nonagricultural employment belonging to a union were included as explanatory variables, but neither demonstrated a statistically significant effect on average hospital wage rates.

Landon and Link included two union variables in their nurse wage regressions. The first was a dummy variable taking the value 1 if 75 percent or more of nurses in the hospital belong to a union, and zero otherwise.[1] A second variable is a union interaction variable, the product of the first variable and a binary vari-

[1] According to Landon and Link, "In preliminary regressions not included in this paper, other measures of unionization were tested, including percent unionized, a dummy equal to 1 if there were any union membership, and zero otherwise. Unionization was always significant, and its coefficient had the predicted sign." (Landon and Link, 1975, p. 654.)

able, which assumed the value 1 if 30 percent or more of the State labor force is unionized. Coefficients of the first variable proved to be statistically significant or nearly so in all regressions. Those for the second had lower associated t-ratios, but nevertheless are suggestive of an interaction effect. One may infer from Landon and Link's diploma salary regression that unionization raises nurses' salaries by about 5 percent.

The issue of the effects of unionization, outside the health sector, has been studied in great depth by economists with interests in the labor field. Recently, there has been considerable interest in the impact of unions on wages in the public sector. As a rule, significant effects have been found, but the magnitude of effect has varied from study to study. See, for example, Ashenfelter (1971), Baird and Landon (1972), Ehrenberg (1972, 1973a, 1973b), Ehrenberg and Goldstein (1975), Frey (1975), Getz and Vahaly (mimeo.), Hall and Carroll (1973), Kasper (1970), Schmenner (1973), and Thornton (1971).

"Philanthropic Wage-Setting"

Feldstein (1971) has documented the substantial increase in occupation-specific wage rates within the hospital sector during the course of the 1950's and 1960's. By the late 1960's, hospital wage rates in certain occupations and certain cities slightly exceeded wage rates of workers in the same occupations and cities who had nonhospital employers. Feldstein attributed some of hospital employees' wage rate gains to increased demand for the hospital's product, the result of improved third-party coverage and rising patient incomes. According to Feldstein, a portion of the hospital wage rate increases reflect real costs, that is, payments necessary to attract labor from other sectors; but he suggested another portion represents pure transfer payments to hospital workers or "rents," payments beyond the amount needed to attract additional workers. By pursuing this "philanthropic wage policy," as Feldstein termed it, hospital administrators may be meeting one of their own objectives, namely to improve the welfare of hospital staff as well as of patients.

In support of the philanthropic hypothesis, Feldstein first presented data showing many hospitals in the late 1960's paid personnel in some clerical and housekeeping occupations higher wages than did employers in other sectors. Second, he argued that standard economic theory cannot explain why salaries for interns and residents at such hospitals as the Massachusetts General Hospital (MGH) have increased dramatically in recent years even though applications for intern and residency positions at these high prestige hospitals have exceeded available

places by far. In situations where there is excess demand for places, salaries would normally be expected to fall, not rise.

The philanthropic wage hypothesis provides a possible and interesting explanation of recent hospital wage behavior. However, Feldstein's evidence is at best weakly suggestive. For one, narrowing wage differentials are inadequate by themselves, because even if we examine specific occupations, intraoccupational variations in personal attributes of employees are not held constant. Hospitals may have raised hiring standards *and* wage rates in response to the demand factors Feldstein mentioned. Higher standards for workers may yield benefits to the hospital in terms of reduced labor turnover, lower worker absenteeism rates, fewer difficulties in day-to-day management and the like. Only after adjusting for worker attributes is it possible at all to speak of a philanthropic wage effect, as it has been defined. Even then, a few difficulties remain. For example, hospitals may have to grant unusually high wage increases if they desire to expand employment rapidly. What appears to be philanthropy may be an effort on the part of hospital employers to offset labor's transactions costs associated with changing jobs and/or moving.

Certainly Feldstein did not mean to apply the concept to for-profit hospitals, but rather to not-for-profit hospitals. Our test of Feldstein's hypothesis is whether, holding a number of factors constant, not-for-profit hospitals pay higher wages. Although this is the test of the hypothesis performed in this chapter, it must be stressed that chapter 2's model, which provides the framework for both chapters 2 and 3, cannot account for philanthropic behavior. Unless the supply of nurses is completely inelastic, a highly restrictive and unrealistic assumption, paying hospital employees "rents" would generate an excess supply of prospective employees. The hospital would then have to use some nonmonetary method of rationing its scarce positions.

Compensating Wage Differentials

Clearly, some geographic areas are regarded by nurses on the whole as less desirable locations in which to work (and live). An interesting and promising approach for assessing the desirability of alternative locations is to estimate a wage equation with various amenity variables included as explanatory variables. Coefficients obtainable by means of regression analysis indicate the degree to which individuals value various locational amenities, such as absence of crime and air pollution, good schools and health facilities and the like. If individuals truly value these amenities, the assumption underlying this wage analysis is they should be willing to work for less. Getz and Huang (mimeo.) have

used this method to develop a location-specific index of the quality of life.[2] As these authors stated (p. 25), "The information provided by the wage equation estimation is a substantial improvement over the ad hoc valuing of quality of life in different cities."[3]

Empirical Results: Wage Regressions Without Benefits Variables

Our discussion of empirical results is divided into two sections. In the first, wage regressions not containing explanatory variables describing various hospital offerings are discussed. All empirical work reported here uses the Survey of Hospital Directors of Nursing as the primary data source. The dependent variable is the hospital's monthly salary for a nurse with a diploma.

Table 4 presents simple correlations among wages (deflated by DFL1) for nurses by type of nurse training program attended and experience, both with the nurses' current employer and in other employment settings. As is evident from the correlations, wages are highly correlated with one another. (All correlations are statistically significant at better than the 5-percent level.) Wages of nurses with similar on-the-job experience tend to be more highly correlated than those within a given type of training category. For example, the hospital's starting salary for a diplomate is more closely related to the starting salary for an associate degree recipient than it is to the salary of a diplomate with 5 or more years experience with the hospital. The wages for nurses in various experience-training categories are sufficiently closely related to permit generalizations from a regression with the starting diploma wage as the dependent variable.

For conceptual reasons, one expects to observe consistencies between the staffing results presented in chapter 2 and the wage regressions in this chapter. While specific directions of effect cannot be deduced from a formal model, such as chapter 2's, our findings with regard to staffing are generally plausible. If one accepts the chapter 2 parameter estimates as reasonable, one has rather strong expectations about directions of effect with regard to wages.

In particular, chapter 2's model implies that, with the exception of the factor-supply variables, the exogenous variables should have the same *direction* of impact on both staffing and wages. If the directions of impact between staffing and wage regressions differ and/or marked changes in statistical significance occur, one may infer, depending on patterns of the results,

[2] Also, see Goffman, *et al.*, (1975).

[3] Specific references to the ad hoc approach cited by Getz and Huang are Liu (1975) and Louis (1975).

Table 4.—Correlations among nurse wages for various experience and training categories [1]

	WAGE1	DWAGE2	DWAGE3	DWAGE4	DWAGE5	AWAGE1	AWAGE2	AWAGE3	AWAGE4	AWAGE5	BWAGE1	BWAGE2	BWAGE3	BWAGE4	BWAGE5
WAGE1	1.00	0.95	0.94	0.84	0.69	0.96	0.93	0.92	0.82	0.67	0.97	0.91	0.89	0.80	0.62
DWAGE2		1.00	0.93	0.99	0.94	0.93	0.99	0.94	0.89	0.74	0.95	0.99	0.92	0.88	0.70
DWAGE3			1.00	0.91	0.92	0.91	0.93	0.99	0.92	0.79	0.93	0.92	0.97	0.91	0.75
DWAGE4				1.00	0.95	0.84	0.89	0.93	0.99	0.95	0.85	0.89	0.92	0.98	0.92
DWAGE5					1.00	0.68	0.74	0.78	0.94	1.00	0.70	0.74	0.80	0.95	0.99
AWAGE1						1.00	0.94	0.92	0.84	0.68	0.95	0.89	0.88	0.81	0.64
AWAGE2							1.00	0.94	0.90	0.73	0.93	0.97	0.91	0.87	0.70
AWAGE3								1.00	0.93	0.79	0.91	0.91	0.96	0.90	0.75
AWAGE4									1.00	0.95	0.84	0.87	0.91	0.97	0.92
AWAGE5										1.00	0.68	0.72	0.79	0.94	0.99
BWAGE1											1.00	0.95	0.93	0.84	0.68
BWAGE2												1.00	0.93	0.89	0.73
BWAGE3													1.00	0.93	0.79
BWAGE4														1.00	0.94
BWAGE5															1.00

[1] The prefixes D, A, and B signify diplomates, holders of the associate degree, and baccalaureates, respectively. The suffixes 1, 2, 3, 4, 5 refer to, respectively, nurses "starting—no previous experience elsewhere" (1); "starting—less than five years recent experience elsewhere" (2); "after two years with your hospital—no previous experience elsewhere" (3); "after five years with your hospital—no previous experience elsewhere" (4); "after 10 years with your hospital—no previous experience elsewhere" (5). WAGE1 = DWAGE1.

that: (1) an assumption of competition in the market for nursing sources is more tenable than an assumption of monopsony; (2) this market contains monopsonistic elements but has failed to clear; and (3) some of the effects, evident in chapter 2's empirical results on staffing, are simply not sufficiently strong to be reflected in the wage regressions; and/or (4) the omnipresent specter of specification error exists. Our discussion of the empirical results contained in table 5 is organized around the exogenous variable categories developed in the previous chapter. Variables have been defined in table 2.

With reference to the preference-production function variables, we find no differential in nurse wages based on the hospital's affiliation with a nursing school (NURSC). Taken in conjunction with the results on staffing, this finding suggests that higher levels of nurse staffing in nursing school-affiliated hospitals are principally the result of the hospital's education function.

The VOLUN and PROPRI coefficients are fully inconsistent with Feldstein's "philanthropic wage hypothesis." In fact, the

Table 5.—Nurse wage regressions

Explanatory variable	Dependent variable - WAGE1				
	1.	2.	3.	4.	5.[1]
MEDSC	0.036	—	0.034	0.048	0.012
	(0.025)	(0.01)	(0.025)	(0.025)	(0.025)
NURSC	—	—	—	—	0.017
	(0.02)	(−0.03)	(0.01)	(0.04)	(0.013)
MEDSA	0.031	—	0.034	0.037	0.029
	(0.020)	(0.03)	(0.025)	(0.020)	(0.020)
VOLUN	−0.010	−0.013	−0.014	—	−0.016
	(0.013)	(0.012)	(0.012)	(−0.00)	(0.012)
PROPRI	0.017	0.016	—	0.021	0.013
	(0.021)	(0.021)	(0.03)	(0.020)	(0.021)
INC	[2] 0.118	[2] 0.101	[2] 0.118	[2] 0.115	0.036
	(0.033)	(0.034)	(0.033)	(0.034)	(0.035)
PHYSG	−0.014	−0.010	−0.012	—	—
	(0.010)	(0.010)	(0.010)	(–)	(–)
MD	—	—	—	0.012	0.011
	(–)	(–)	(–)	(0.012)	(0.012)
PHYSP	[3] 0.008	0.004	[3] 0.008	—	—
	(0.003)	(0.004)	(0.003)	(–)	(–)
COST	—	—	—	—	—
	(−0.02)	(−0.03)	(−0.02)	(−0.02)	(−0.03)
SICK	[3] 0.055	[3] 0.059	0.050	0.047	0.033
	(0.027)	(0.026)	(0.027)	(0.027)	(0.026)
ELD	—	—	—	—	—
	(−0.01)	(−0.01)	(0.02)	(−0.03)	(0.02)

Table 5.—Nurse wage regressions—Continued

Explanatory variable	Dependent variable – WAGE1				
	1.	2.	3.	4.	5.[1]
URB	—	—	—	—	0.003
	(0.00)	(−0.03)	(0.01)	(0.04)	(0.002)
OBEDS	—	—	—	—	—
	(−0.01)	(−0.01)	(−0.00)	(−0.01)	(−0.01)
SAFE	0.020	0.020	0.020	0.020	[3] 0.028
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
BLK	—	—	—	—	—
	(−0.01)	(−0.03)	(0.00)	(0.03)	(0.01)
HDENS	[2] 0.030	[2] 0.030	[2] 0.028	[2] 0.028	[2] 0.023
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
TEMP	—	—	—	—	—
	(−0.00)	(0.01)	(−0.00)	(0.00)	(−0.08)
SUSP	—	—	—	—	—
	(0.10)	(0.07)	(0.11)	(0.13)	(0.07)
RAPE	—	—	—	—	—
	(0.01)	(0.00)	(0.01)	(0.00)	(0.09)
AUTO	—	—	—	—	—
	(−0.04)	(−0.06)	(−0.05)	(−0.05)	(0.05)
EXP	—	—	—	—	—
	(0.07)	(0.09)	(0.06)	(0.04)	(0.05)
NSTU	[2] −0.052	[2] −0.052	[2] −0.062	[2] −0.072	[2] −0.082
	(0.019)	(0.018)	(0.018)	(0.018)	(0.018)
UNION	0.026	0.031	0.019	0.020	[3] 0.039
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
MON	−0.006	[3] −0.010	−0.009	−0.009	[3] −0.010
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
WAGE2	0.063	0.065	0.063	0.072	0.008
	(0.053)	(0.052)	(0.053)	(0.053)	(0.052)
WAGE3	[2] 0.240	[2] 0.223	[2] 0.247	[2] 0.253	[2] 0.240
	(0.064)	(0.064)	(0.063)	(0.064)	(0.059)
CN1	—	—	[3] 0.063	[3] 0.069	[3] 0.071
	(–)	(–)	(0.031)	(0.031)	(0.029)
CN2	—	—	0.017	0.021	0.016
	(–)	(–)	(0.015)	(0.015)	(0.015)
PR	—	—	[3] −0.069	[3] −0.074	−0.047
	(–)	(–)	(0.031)	(0.031)	(0.030)
BEDS	—	[2] 0.020	—	—	—
	(–)	(0.007)	(–)	(–)	(–)
CONSTANT	4.71	4.74	4.74	4.72	5.81
	(–)	(–)	(–)	(–)	(–)
	R^2=0.31	R^2=0.32	R^2=0.31	R^2=0.31	R^2=0.28
	F(15,487)	F(14,488)	F(17,487)	F(16,488)	F(19,485)
	=[2] 14.5	=[2] 16.1	=[2] 13.1	=[2] 13.5	=[2] 9.8

[1] Uses DFL2. See table 2.
[2] Significant at the 1-percent level.
[3] Significant at the 5-percent level.
Note: Numbers in parentheses are standard errors when there is a parameter estimate; otherwise they are partial correlations.

proprietaries appear to pay nurses about 2 to 4 percent more than other hospitals. To maintain this hypothesis in the face of the evidence in table 5 would require an argument that owners of for-profit hospitals also grant wages to employees in excess of the minimum amount required to obtain a given quantity of nursing services. Although such hospitals may find it advisable to pay more than the minimum amount to reduce turnover or obtain more capable nurses, it is doubtful that for-profit hospitals would be motivated by charitable considerations per se. Table 5 regressions permit one to examine the effect of hospital ownership on nurse wages, holding a large number of factors constant. Elsewhere (Elnicki and Sloan, 1975), we presented a table reporting mean wages for nurses by type of basic nursing program and nurse experience. Mean wages offered by proprietaries were consistently higher than corresponding wages for voluntary and government hospitals. The percentage differences among hospital ownership types evident from the table of means, are about the same as those implied by table 5's VOLUN and PROPRI parameter estimates.

Empirical evidence on the product demand variables relates to the first test of monopsony power. If wages tend to be high in high product demand areas, there is empirical support for the monopsony hypothesis.

In chapter 2, area per capita income (INC), the first product demand variable, had a positive impact on nurse staffing levels. The INC variable also has a significantly positive effect on nurse wages in the first four regressions in table 5. The fifth regression uses an alternative deflator that allows for cost-of-living variations within States (DFL2). To the extent the deflators contain measurement errors, it can be shown that the INC parameter estimate will be positively biased when WAGE1 is the dependent variable (since both dependent and explanatory variables use the same deflator). The fact that INC parameter estimates are higher in the first four regressions raises the possibility that the second deflator more accurately measures the area cost of living. This inference, however, is not very convincing, because parameter estimates of other explanatory variables, which have been deflated, are either higher in the fifth regression than in the other regressions or are unaffected by the choice of price deflator.

On balance, the INC coefficients in table 5's regressions lend support to the view the market for nursing services contains monopsonistic elements. However, the poor performances of PHYSC and PHYSP, the variable MD (the sum of the two physician variables), and the reimbursement variable do not support

the view that hospitals exercise monopsony in this market. The COST variable is omitted from all of table 5's regressions; but it performed very poorly when included in several wage regressions not reported in this table. As these variables' elasticities are not very high in the staffing regressions, an alternative explanation is that movements in the latter exogenous product demands variables do not produce staffing responses sufficiently large to require a meaningful increase in nurse wages.

The following aspects of the nurse factor-supply variables are noteworthy. Although BLK enter insignificantly in all regressions, the lack of significance is attributable to multicollinearity (as judged by patterns among the simple correlations not reported). Taken in conjunction with the evidence on staffing, the wage regression results indicate hospitals located in black and poverty areas are at a disadvantage in securing nurses. The crime variables might have performed more satisfactorily if measures had been available at the community rather than the State level. The parameter estimates of the variable SAFE (parking is only "moderately safe" or "unsafe") are positive and statistically significant, or nearly so, in all wage regressions. However, if the variable truly accounted for disamenities associated with unsafe parking, or more generally, an unsafe environment in the vicinity of the hospital, one would have expected SAFE's parameter estimates to be negative in the staffing regressions. Small, but positive estimates were observed in chapter 2's staffing analysis.

The statistically significant NSTU coefficients reinforce our findings in chapter 2 with regard to professional nurse training. Increased nursing school enrollments may thus be expected to depress starting salaries of nurses in States where such expansions take place and, at the same time, lead to increases in nurse staffing.

Although the union (UNION) and monopsony (MON) measures have no discernible effect on nurse employment, parameter estimates corresponding to these variables consistently exceed their standard errors and are sometimes significant at the 5-percent level. However, these estimates imply small impact on wages. The largest UNION coefficient suggests unions raise professional nurses wages by 4 percent; and the MON elasticities are in the 0.01 range, far too small to imply substantial employment effects. Indeed, the UNION and MON demonstrated no effect in chapter 2.

Our estimate of unionization's impact is very close to Landon and Link's (1975) estimate of unionization's direct effect. As we have noted, their union variable took the value 1 if 75 percent or

more of nurses were unionized, and zero otherwise. In our research, UNION assumes the value 1 if "there is a collective bargaining agreement in your (the respondent's) hospital covering RNs." Landon and Link noted, based on experimentation with alternative measures, that their results on unionization effects were reasonably invariant with respect to the precise way the union variable was specified. Certainly the consistency between table 5 and Landon and Link's research on union's wage impacts lend further support to their finding. They also included an interaction term in their wage regressions to capture union "threat" effect on nurse wages. When added to the direct union effect, the total union effect was about twice as large as the effect associated with the UNION variable in table 5. We have also experimented with "threat" effect variables in preliminary regressions, but not ones interacting with UNION. In our preliminary work, inclusion of a union threat variable contributed nothing to explaining interhospital variation in nurse wages. Therefore, this variable has not been included as an explanatory variable in table 5.

Underlying differences in the performance of the union threat variable and the lower marginal impact of hospital concentration in our study may relate to the number of explanatory variables included in Landon and Link's regressions as compared with our regressions. They included far fewer explanatory variables. Since they presented several regressions, some of which contain a hospital concentration measure as the single independent variable (as well as others containing a concentration measure accompanied by several other independent variables), it is evident that concentration's measured effect is quite sensitive to the wage equation's specification. The same conclusion can be drawn from our own empirical analysis, although not from the particular regressions presented in table 5.

Our specification is somewhat more complete, lending support to the view that Landon and Link's estimates of concentration's effects may be somewhat high. However, even though there may be reason to argue over these variables' precise impact, there is sufficient evidence to support some basic conclusions.

Viewing chapter 2 and 3 results together, it appears monopsony power has a modest influence on nurse wage levels. Judging from results presented in chapter 2, nurse employment effects attributable to hospital concentration are essentially nil. Unionization tends to offset monopsony effects when they appear together. Given the small percentage of hospitals with collective bargaining agreements covering professional nurses (11.5 percent in 1973, according to the Survey of Hospital Directors of

Nursing) and considering the magnitude of the UNION and the Landon and Link union coefficients, it cannot be argued this factor has been an important source of increases in professional nurse wages to date. The possibility remains that collective bargaining is really an endogenous variable; that is, nurses form collective bargaining arrangements when warranted by poor conditions. If so, existing measures of union's impact would be biased, probably in the downward direction. This issue is certainly sufficiently important to merit further research on it.

The regulation variables show professional nurse wages (adjusted for area cost-of-living differences) to be higher by about 6–7 percent in States with certificate-of-need laws (CN) prior to 1972; and lower by about 5–7 percent in New Jersey and New York, the States (as of 1973) with the broadest mandatory prospective reimbursement (PR) coverage. It is reasonable to expect CN and PR to affect wages via their employment effects. Although, as seen in chapter 2, some employment impact is evident with regard to CN, PR demonstrates absolutely no impact in our staffing regressions. These results are suggestive, but they should mainly be used to encourage further work on this topic. An important extension would be to gauge regulations' impact using a time series of cross sections (including observations on hospitals before and after the regulatory device was instituted) in order to verify that the regulation variables measure regulation as opposed to unspecified "State" effects.

The Relationships of Selected Hospital Benefits to Nurse Wages

In preliminary work, we developed a wage measure that included a monetary equivalent of various fringe benefits offered nurses by the hospital. The empirical results, however, differed only slightly from the results presented in table 5. Furthermore, since information on fringe benefits was not as well reported as information on wages, the number of complete observations available for analysis was smaller.

In this section, we shall use another approach. Nonwage benefits are included as explanatory variables in regressions with the hospital's starting monthly salary for the diplomate (WAGE1) as the dependent variable. Wages represent only one, albeit important, form of nurse compensation. The null hypothesis investigated in this section is wages tend to be lower in hospitals offering comparable generous amounts of other, nonwage benefits. If the null hypothesis is rejected, i.e., specific nonwage benefits make a difference in wages in the anticipated (negative) directions, one may make the inference that nurses

value these benefits. As noted earlier, this is the hedonic method for evaluating nurse preferences for specific benefits and job attributes.

This section uses the benefit package concept developed by Elnicki (1975). The packages attempt to distinguish hospitals with unusually good offerings from the rest. If a hospital failed to respond to a particular benefit question, we have assumed the offering relating to that question is not particularly outstanding, and the hospital is assumed not to offer the package. By making this somewhat admittedly arbitrary assumption, we have been able to circumvent the missing data problem. Definitions of all but one of the package variables are contained in appendix B, table B–1. For purposes of this chapter's analysis, we have eliminated the SHFTPAKG variable since the dependent wage variable refers to the day shift.[4] We have added a variable not included previously, defined CHLDPAKG. This variable assumes the value 1 if day care is fully or partially subsidized by the hospital and maternity leaves are not covered by sick leaves, and is zero otherwise.

Table 6 presents mean values of the wage and benefits variables to be used in the regressions that follow. As seen in table 6, with the exception of CHLDPAKG and SAFEPK,[5] only a minority of hospitals have, by our criteria, outstanding offerings.

Table 6.—Wage and nonwage benefit variable means

Variables	Mean
WAGE1	[1] 663.54
HOMEPAKG	0.33
LEAVEPAKG	0.21
EDUCPAKG	0.38
WORKPAKG	0.13
INSURPAKG	0.15
CHLDPAKG	0.58
SAFEPK	0.72

[1] Antilog of WAGE1 (as used in correlations and regressions).

Table 7 gives simple correlations among wage, benefit, ownership, and union variables; these patterns are especially noteworthy. First, there are as many positive correlations between WAGE1 and the benefits variables as there are anticipated nega-

[4] In retrospect, this may have been an inadvisable decision. Some hospitals may pay a higher base wage with no differentiation among shifts. This policy, if followed, would be poor management, unless one maintains nurses are indifferent about the time of day they work. Few knowledgeable persons are likely to maintain nurses are indeed indifferent about this issue.

[5] In table 3 and earlier in this chapter, the parking variable referred to unsafe parking. Here it refers to *safe* parking.

Table 7.—Wage and nonwage benefit correlations

	WAGE1	HOMEPAKG	LEAVEPAKG	EDUCPAKG	WORKPAKG	INSURPAKG	CHLDPAKG	SAFEPK	VOLUN	PROPRI	UNION
WAGE1	1.00	[1] 0.11	0.00	−0.00	0.00	[1] 0.13	[1] 0.09	[1] −0.14	−0.01	[1] 0.09	[1] 0.11
HOMEPAKG		1.00	0.04	[1] 0.09	0.03	[1] 0.11	[1] 0.13	0.03	[1] 0.17	−0.02	0.00
LEAVEPAKG			1.00	−0.01	[2] 0.05	−0.03	−0.07	[1] −0.09	[1] −0.11	−0.04	−0.03
EDUCPAKG				1.00	0.02	[1] 0.10	0.02	−0.02	[1] 0.15	[1] −0.11	[1] 0.07
WORKPAKG					1.00	−0.02	0.01	0.02	0.01	0.00	0.00
INSURPAKG						1.00	0.07	−0.04	[1] 0.19	−0.04	[1] 0.06
CHLDPAKG							1.00	0.02	[1] 0.17	−0.01	0.01
SAFEPK								1.00	0.02	−0.02	−0.01
VOLUN									1.00	(2)	−0.03
PROPRI										1.00	−0.04
UNION											1.00

[1] Significant at the 5-percent level.
[2] Correlation is meaningless.

tive correlations. If there are indeed compensating wage differentials for benefits valued by nurses, at least the partial (as opposed to the simple correlations shown in the table) must be negative. Second, simple correlations among the benefits variables themselves tend to be weak. There are negative as well as positive signs on these correlations. Third, while the correlation between the proprietary hospital dummy variable PROPRI and WAGE1 is positive and significant, the correlations between PROPRI and the benefit-package variables tend to be negative. This may be due to the small mean size of for-profit hospitals, which may make their provision of certain types of benefits comparatively costly. Fourth, with the exception of the LEAVEPAKG, voluntary hospitals tend to be relatively generous in their benefit offerings. Judging from the negative simple correlations of VOLUN and PROPRI, it is apparent government hospitals provide the highest levels of vacation and sick leave. This pattern is also seen in the table of mean values, based on data from the Survey of Hospital Directors of Nursing, presented in Elnicki and Sloan (1975). Fifth, the positive simple correlation between WAGE1 and UNION is the highest by far among the correlations in the column of UNION correlations. It is doubtful the UNION variable would have performed very well had we estimated regressions with each of the package variables as the dependent variables. These low correlations give further impetus to our previous suggestion that unionization be treated as an endogenous variable in future research, as poor offerings may be a stimulus for the formation of unions.

Table 8 contains two nurse wage regressions with the package variables included. All monetarily expressed variables are deflated by DFL1, our State price index. Variant I contains only the benefits variables. Variant II is based on precisely the same specification as table 8's first regression. Variant II's R^2 is only slightly higher than its table 8 counterpart, but this regression's F-statistic is lower because several of the benefit variables' coefficients are statistically insignificant.

If hospitals with attractive offerings are able to hire nurses at lower wages, coefficients of variables HOMEPAKG through SAFEPK should have negative signs. In Variant I, negative signs are only observed in the cases of LEAVEPAKG, EDUCPAKG, and SAFEPK, but, of these, only SAFEPK's coefficient attains statistical significance at the 5-percent level or better.

In Variant II, when a number of exogenous wage determinants are included, both LEAVEPAKG and SAFEPK parameter estimates have anticipated negative signs and are statistically significant at the 5-percent level. The EDUCPAKG parameter

Table 8.—Wage regressions with nonwage benefit variables included

Explanatory variables	Variant 1	Variant 2
HOMEPACK	[1] 0.028	[1] 0.024
	(0.013)	(0.011)
LEAVEPAKG	−0.001	[1] −0.026
	(0.015)	(0.013)
EDUCPAKG	−0.007	−0.021
	(0.125)	(0.011)
WORKPAKG	0.002	0.007
	(0.018)	(0.016)
INSURPAKG	[1] 0.041	0.023
	(0.017)	(0.015)
CHLDPAKG	0.022	0.016
	(0.012)	(0.011)
SAFEPK	[2] −0.044	[1] −0.024
	(0.014)	(0.012)
MEDSC	—	0.049
	(0.13)	(0.025)
MEDSA	—	0.027
	(0.12)	(0.020)
VOLUN	—	−0.018
	(−0.07)	(0.013)
PROPRI	—	0.006
	(0.10)	(0.021)
INC	—	[2] 0.121
	(0.26)	(0.033)
PHYSG	—	−0.015
	(−0.15)	(0.010)
PHYSP	—	0.006
	(0.27)	(0.003)
SICK	—	0.050
	(0.10)	(0.026)
HDENS	—	[2] 0.030
	(0.20)	(0.007)
NSTU	—	[2] −0.057
	(−0.23)	(0.018)
UNION	—	0.027
	(0.11)	(0.018)
MON	—	−0.009
	(−0.30)	(0.005)
WAGE2	—	0.079
	(0.29)	(0.052)
WAGE3	—	[2] 0.206
	(0.30)	(0.064)
CONSTANT	6.50	4.690
	(−)	(−)
	R=0.05	R=0.33
	F(7,501)=3.9	F(21,487)=11.5

[1] Significant at the 5-percent level.
[2] Significant at the 1-percent level.
Note: Numbers in parentheses are standard errors when there is a parameter estimate; otherwise they are partial correlations.

estimate is negative and almost significant at this level. The variable HOMEPAKG continues to have a positive impact. Perhaps, this variable accounts for our unspecified urbanization effect rather than the intended housing effect. But this justification cannot explain the performance of WORKPAKG, which has a near zero coefficient with a high associated standard deviation. A hospital satisfying the criteria for WORKPAKG to equal 1 should clearly have good working conditions. Repeating these criteria, they are:

> Secretaries or clerks at nursing stations; RNs frequently determine their own schedules; diploma graduates can fill supervisory positions; percent of RNs always working the same shift greater than average; percent of supervisory positions filled internally greater than average; and day notice given for a permanent shift change is greater than average or not applicable.

As will be seen in chapter 5, there is some evidence it is (comparatively) difficult for the prospective nurse employee to determine working conditions prior to employment. This type of ignorance is one possible reason for WORKPAKG's poor performance.

Link and Landon (1976) also included benefits variables in some variants of their nurse wage regressions. They described their nonmonetary benefits variables as follows:

> In addition to starting salary, the surveyed hospitals were asked to list nonmonetary factors which they felt were significant in recruiting nurses. From these responses a series of dummy variables was created to indicate whether or not the hospital included in its list a particular class of benefits. The four classes of benefits found most frequently in the responses were included in this study. They were (1) educational benefits (teaching programs available, teaching hospital, paid tuition for advanced study, etc.); (2) shift benefits (nurses can choose their own shift, freedom to work the same shift all the time, etc.); (3) new hospital (new facility, excellent facilities, etc.); and (4) parking-transportation (free, convenient parking, convenient to public transportation, etc.). (p. 153.)

Although details in specification differ, Landon and Link's first variable roughly corresponds to EDUCPAKG, their second to WORKPAKG, and their fourth to SAFEPK. Our Survey of Hospital Directors of Nursing did not collect data on the age of the hospital's facilities. However, Landon and Link did not include variables analogous to HOMEPAKG, LEAVEPAKG, INSURPAKG, and CHILDPAKG. They found shift benefits are associated with lower nurse wages, but the parking-transportation variable has a positive impact. Although plausibly negative, their shift parameter estimate was not significant at conven-

tional levels. The education benefits and new facilities variables performed very poorly.[6]

Overall, our benefit package results are more plausible than Link and Landon's. Yet one should be cautious about placing too much weight on our results. Some of the coefficients of the package variables have unanticipated positive signs. Even the significantly negative coefficients imply small marginal impacts on wages. For example, both LEAVEPAKG and SAFEPK coefficients imply wage reductions of around 2.5 percent each.

There are a number of nonmutually exclusive explanations for the presence of some positive benefit variable parameter estimates and the small magnitudes of response implied by the parameter estimates with the anticipated negative coefficients. First, it is possible these benefits are simply not very important to professional nurses. Second, the benefits may be important but poorly measured by our Survey of Hospital Directors of Nursing and by Landon and Link's survey. Third, nurses may be ignorant of the levels of various hospital offerings; and nurses may consider and/or find the costs of obtaining such information, particularly before actually joining the hospital as an employee, to be quite high. The first and the third reasons are related, since nurses would presumably be willing to incur the search costs if they valued the kinds of offerings represented by the above package variables highly. Although poor measurement cannot be ruled out, the evidence on the offerings presented in this chapter, viewed in combination with evidence in later chapters, tends to weaken this explanation.

Summary, Conclusions, and Implications

Four issues have been emphasized in this chapter: the use of monopsony power by hospitals in the market for nursing services; the effects of unions on nurses' wages and, to a somewhat lesser extent, on nonwage benefits; the philanthropic wage hypothesis; and the relationships among wage and nonwage benefits.

As stressed earlier, the possible existence of monopsony or oligopsony in the market for professional nursing services is far more than a scholarly issue. Since the possibility of such market imperfections have implications for nurse employment levels, they should concern policymakers concerned with the spatial distribution of nurses. The evidence presented in this and other studies on nurses, however, indicates that monopsony effects in

[6] Landon and Link obtained a more precise new hospital facilities parameter estimate when they omitted an area cost-of-living variable. We do not put much emphasis on this regression, because omission of a price index is a potentially serious source of specification bias.

this market are, at most, small. One may infer they contribute little to explaining the substantial geographic variation in professional nurse-to-population ratios.

Yett (1970) and others have proposed that observed professional nurse vacancies in hospitals may be in fact "equilibrium vacancies," which may occur in situations where hospitals possess and exercise monopsony power. If the monopsony factor is not very important, it is not likely to provide a very successful explanation of vacancies either. On the average, vacancy rates were not high as of the early 1970's. According to the Survey of Hospital Directors of Nursing, as of 1973, there were nearly 10 filled professional nursing positions for every position vacant or nonbudgeted but desired by the hospital. Since this survey was designed to slightly oversample hospitals with difficulties in professional nurse staffing, even lower vacancy rates would have probably been reported, had the sample been truly representative of U.S. hospitals as a whole.

We were unable to discern any impact of collective bargaining agreements covering professional nurses on professional nurse employment, as reported in chapter 2. However, parameter estimates in wage regressions presented in this chapter suggest such agreements raise wages by approximately 2–4 percent. These estimates only apply to nurses working in hospitals with collective bargaining agreements. Our tests for union "threat" effects yielded nothing. Although we have estimated no regressions with specific nonwage benefits as dependent variables, it appears unlikely, judging from patterns among simple correlations, that collective bargaining would have even this much of an effect on nonwage benefits.

In spite of these conclusions about collective bargaining, two comments are in order. First, Landon and Link found somewhat higher (although nevertheless small) direct effects of collective bargaining on nurses' wages. Moreover, they detected some union "threat" effects. Second, it is quite possible unionization should be treated as an endogenous rather than an exogenous variable, as in this and the *vast* majority of other studies. If unions are introduced where conditions are poor, it is likely that treating unionization as exogenous results in underestimates of their impacts. This is a fruitful area for future research.

We have conducted a test of the philanthropic wage hypothesis. Valid questions about the hypothesis can be raised on a theoretical level. Given results contained in this chapter, it would appear questionable on an empirical basis as well.

An hedonic approach has been used to assess the desirability of specific nonwage benefits to professional nurses. The results

suggest nurses are willing to sacrifice small amounts of money at best for selected nonwage benefits. Since other methods will be used to assess issues involving nonwage benefits in chapters that follow, it is best to suspend judgment at this point until all the evidence is in.

According to the conceptual framework provided in chapter 2, the nurse staffing and wage equations come from the same underlying hospital model. Although theoretical predictions from the model as to the directions of impact on the dependent variables (positive or negative) are often ambiguous, the model does imply a change in a given exogenous variable will generally affect both nurse staffing and wage levels in consistent ways. For example, if increased enrollments of local nursing schools lower wages, the increase should at the same time increase professional nurse staffing in hospitals as well as in other settings. Likewise, if nurses demand higher earnings to work in less attractive settings, this should be reflected in terms of reduced staffings and higher earnings levels.

Responses of the staffing and wage dependent variables to increased enrollments are indeed consistent. Wages fall and hospitals employ more nurses per bed (set up and staffed). The mechanism and implications have already been explored in chapter 2, and we need not repeat ourselves here. However, it is worth emphasizing that consistency between the two chapters makes us more confident of our results. Findings with regard to inner-city areas that include high proportions of blacks and low income families are also consistent. Wages are higher and staffing levels are lower. Although nurses' preferences for other areas may reflect discrimination in part, which is regrettable, this is a fact of life with which health manpower policymakers have to deal. There is also an inconsistency which we noted above. Hospitals with "unsafe" parking pay higher wages, but there are no differences in terms of nurse staffing. Although professional nurse staffing levels in hospitals affiliated with schools of nursing tend to be higher, wages do not differ. In this instance, there is not necessarily an inconsistency as demand may be higher, but wages do not rise because proximity to nurse education is of some value to practicing nurses.

Our rather preliminary assessments of the effects of forms of regulation, certificate of need (CN) and prospective reimbursement (PR) suggest (1) CN has raised the levels of both RN staffing and wages, and (2) PR has had a negative impact on wage rates. Our CN results are broadly consistent with those of Salkever and Bice (1976). However, our results on these regulatory instruments, which are based on a single cross section,

should be replicated with a time series of observations on individual hospitals before firm policy statements are made.

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Chapter 4

INTERSTATE MIGRATION DECISIONS OF PROFESSIONAL NURSES AND THEIR FAMILIES

Frank A. Sloan

Introduction

The decision of a professional nurse and her family to move to another State may be based on a number of different factors. In this chapter we investigate the professional nurse's migration responses to earning differentials, to financial opportunities of her spouse, to differences in amenities particular States offer, and to other monetary and nonmonetary costs associated with moving.

The analysis is principally concerned with five issues:

1. Do observed wage differentials provide a *partial* explanation of the observed interstate migration patterns of professional nurses? If so, increases in the effective demand for nursing services will be followed, at least to some degree, by greater inmigration to States that experience such demand increases.
2. The majority of professional nurses are married and, for various conceptual reasons, the household may place less weight on her financial opportunities than on those of her spouse. Is this pattern indeed evident from interstate migration data? If it is, financial incentives are unlikely to be an important factor in attracting married nurses to specific locations.
3. How great is the effect of previous contact in a given State as a deterrent to moves from that State? If previous contact is an important force, a State may effectively increase its supply of professional nurses by enlarging class sizes in in-State schools of nursing.
4. When nurses move, does the distance from their present State affect their choice of another State; and, if so, what is the magnitude of this effect? If nurses tend to move short distances, holding other factors constant, individual States may gain by expanding the size of nursing school classes within the State; moreover, the payoff of arrangements that pool educational resources among several States would be evident.

5. Financial returns aside, are nurses moving to States with certain amenities: a high level of government service, a good climate, many cultural attractions, low pollution, and low crime? Once the characteristics of geographic areas that nurses find unattractive have been identified, it may be desirable to implement supply-side policies, such as loan forgiveness, to at least partially offset these features (which, however, may make hiring RNs more costly in less attractive areas). Policies, such as loan forgiveness, of course, presuppose that nurse migration is responsive to monetary considerations.

Theoretical Discussion

Sjaastad (1962) introduced the notion that migration is a form of investment in human capital—an investment in the sense that households incur out-of-pocket expenses, time cost expressible both in terms of foregone market and nonmarket production, and psychological and information costs. The potential returns include increments to earnings of *all* family members, potential improvements in nonpecuniary aspects of the jobs of family members, and the availability of amenities (such as recreational opportunities) at an alternative, but not at the household's present location. Migration is a human as opposed to a physical capital investment, because a household only invests when the family itself moves. For the majority of households contemplating interstate moves, the investment calculation is made over a time horizon of several years.

Although net benefits (returns minus costs) are expressed in dollar terms, the framework recognizes that earnings motives constitute only one of several reasons for moving. Ultimately, the household locates where it will find the highest level of satisfaction. Earnings translate into the consumption of goods and services; amenities associated with the job and location are consumed, but are not directly purchased in exchange for money. Although there is no direct financial transaction, households often trade off earnings for various forms of amenities. In fact, such tradeoffs are the basis for the hedonic method employed in chapter 3. Returns from amenities may accrue to the household over part or all of the investment horizon. They yield services over the life of the investment in much the same sense as an investment in such consumer durables as a refrigerator yields cooling services over its life cycle.

Expressed more formally, the family will move if

$$(4.1)\quad PV_{ij} = \underbrace{\sum_{t=1}^{n} \frac{{}^{E}mjt - {}^{E}mit}{(1+r)^t}}_{A} + \underbrace{\sum_{t=1}^{n} \frac{{}^{E}fjt - {}^{E}fit}{(1+r)^t}}_{B} + \underbrace{\sum_{t=1}^{n} \frac{{}^{N}mjt - {}^{N}fjt}{(1+r)^t}}_{C} + \underbrace{\sum_{t=1}^{n} \frac{{}^{N}fjt - {}^{N}fit}{(1+r)^t}}_{D}$$

$$+ \underbrace{\sum_{t=1}^{n} \frac{{}^{R}jt - {}^{R}it}{(1+r)^t}}_{E} - \underbrace{DC_{ij}}_{F} - \underbrace{PC_{ij}}_{G} - \underbrace{FC_{ij}}_{H} > 0$$

where:

PV_{ij} = present value of investment from moving from present location i to alternative location j.
n = expected duration of residence in alternative location.
m = male adult household member.
f = female adult household member.
t = time period.
r = discount rate.
E = *expected* earnings.
N = *expected* nonpecuniary returns from job in location (may be negative).
R = *expected* nonpecuniary returns from location itself (also may be negative).
DC = out-of-pocket expenses associated with move from i to j.
PC = psychological costs of moving from i to j.
FC = foregone earnings from market work and value of foregone nonmarket production specifically associated with the move.

The letters below the expressions in this inequality will facilitate the discussion of the conceptual framework.

It must first be noted PV_{ij} may be positive for several moves from State i to State(s) j. For now, abstracting from uncertainty and search costs, it can be said the presence of any $PV_{ij} > 0$ insures the family will move. If there are several positive PV_{ij}, the household will effectively select the highest one by moving.

Inequality (4.1) distinguishes between net returns accruing to husbands and to wives. Clearly, financial and nonfinancial employment-associated opportunities over the time horizon need not be the same for the husband as for the wife. In particular, the wife may have a lower degree of attachment to the labor force during years in which her husband is gainfully employed. That is, certain $E_{f's}$ and $N_{f's}$, corresponding to years in which the wife is not in the market, may be zero.

Although the terms in (4.1) associated with employment need to be considered separately, it is not necessary that the term R, representing amenities in alternative locations, makes this distinction. The family, for example, may enjoy recreational and cultural opportunities collectively.

For purposes of (4.1), the Ns and the Rs are assumed *in principle* to be expressible in dollar equivalents. In sampling individual families, one would expect to find variations in the amounts families are willing to pay for specific quantities of amenities in much the same way there is variation in the amount families are willing to pay for a refrigerator with specific features.

To continue the analogy, only families willing to pay at least the market price will purchase a refrigerator; and assuming refrigerators (including associated conveniences) are a normal good (i.e., quantity demanded rises with income), the amount families are willing to pay rises with income. Underlying (4.1) is a standard assumption that families maximize utility subject to constraints, and the valuations of the Ns and the Rs are determined by the constrained maximization process. Since income is certainly one of these constraints, the theory predicts the valuations of the Ns and the Rs vary by income. A nurse from a comparatively affluent household might be likely, for example, to place a relatively high value on her working environment and/or a pollution-free environment.

The last three terms (F, G, and H) play an essential role in the migration decision. They mean that even if the sum of A through E is positive, the household may remain in its present location, because moves are costly in terms of direct outlays (including transportation, sales commissions on real estate), the time involved in all aspects of moving, as well as the psychological costs. In fact, the presence of F, G, and H, hereafter called the "wedge," itself introduces an element of indeterminacy into the analysis. One State may be preferable to the household's current State with regard to elements A through D, but no move will take place until the wedge is offset. If the wedge is sizeable, one State may be quite attractive relative to the current State before the threshold is reached when moving occurs. Disequilibrium differentials among States may thus persist for long periods of time. In equilibrium, the sum of elements A through E is zero at the margin.[1]

The discount rate r serves an important function. It has the effect of giving net returns accruing in later periods less weight than those accruing earlier. Thus, net returns accruing later have relatively small effects on PV_{ij}. One way of introducing the riskiness of investments in migration is to allow the discount rate to incorporate a risk premium. Households financing their own migration investments (e.g., from accumulated savings) are likely to attach a premium to these investments substantially in

[1] The wedge gives rise to a form of (consumer) surplus. See Sjaastad (1962).

excess of what they could obtain on a riskless security. Those that must rely on external sources (e.g., loans from banks, personal finance companies) probably pay interest rates far in excess of the rates on riskless securities. Since affluent households are more likely to finance their moves from accumulated savings rather than from borrowed funds, it is reasonable to assume that the discount rates they associate with the migration decision are relatively low. Thus, other factors constant, they are likely to move for a smaller differential in elements A through E. Elements corresponding to the wedge are not discounted in (4.1). The rationale for treating the wedge in this manner is that most of these costs occur immediately. The psychological component may be an exception to this, but the analysis is essentially unaffected by this particular assumption.[2]

The following discussion of the model's explanatory variables is based on (4.1). It is worth emphasizing that in an idealized world of complete specification of the pertinent variables in (4.1) and perfect measurement of these variables, there would be no need for regression analysis, which is useful for modeling situations when there is a stochastic element. In an idealized world, one could compute PV_{ij} from (4.1) for each nurse household. Then, the theory states the nurse (and family) would move to the State with a positive PV_{ij}, and if several PV_{ij}s are positive, to the State with the highest PV_{ij}. However, neither the study of migration decisions in general nor of the migration decisions of nurses in particular is sufficiently advanced to suppose that the specification of variables in (4.1) is more than a first approximation. Nor is it currently possible to impute a value to nonfinancial variables in the formula. Even if it were, the measurement of certain factors, such as the psychological costs household decisionmakers attach to leaving their current location, is certainly still in its infancy. Regression analysis, however, is an extremely useful tool in the present context, as it allows one to test in a formal way whether a particular factor should truly be part of the equation. If a given variable does not exhibit a significant impact on migration decisions in the regression, one has an empirical justification for excluding it.

The Data

The empirical evidence presented here is based on records of professional nurses and their families taken from the One Percent Public Use Sample of the 1970 U.S. Census of Population.

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[2] These issues are discussed more fully in Osburn (1966), Bowles (1970), DaVanzo (1972), and Schwartz (1973, 1976).

Appendix C presents supplementary tables based on this data source.

The Public Use Sample has both advantages and deficiencies for analysis of professional nurse labor market patterns. On the positive side, this data base provides very detailed information on professional nurses, on their spouses and on all children living at home. Data are also available for nurses both in and out of the labor force.

Unfortunately, other surveys, such as the University of Florida's Survey of Registered Nurses, used elsewhere in this study, only include employed nurses. The use of a censored sample (a subsample selected on a particular characteristic such as employment status) may yield biased parameter estimates. Then, the nurse's State is identified for two points in time, 1965 and 1970.[3] Finally, since individual observations are available, one may aggregate the data in ways suitable for the analysis.

There is, however, an important deficiency. Evidence exists that, in some cases, the respondent's occupation has been inappropriately coded. Because of both a tendency of respondents to describe their occupation in a favorable light, and mistakes made by census enumerators and coders, it has been estimated the census overestimates the number of professional nurses by as much as 20 to 25 percent. Many, but by no means all, of the persons erroneously included as nurses in the census are in less skilled health professions.[4] Consistency checks performed on the nurse sample drawn from the Public Use tapes showed that some persons listed as professional nurses in the 1970 census were as young as 14, and/or had fewer than 12 years of schooling, and/or had blue-collar occupations in 1965. Only in a very few instances would one expect an individual to move from a blue-collar occupation to nursing.

For purposes of the empirical analysis presented here, these screening criteria were used.[5] All persons included as professional nurses must be female and have had at least 12 years of schooling. All such persons over age 32 in 1970 must have been professional nurses in 1965. Persons included as professional nurses age 32 or below must have been professional nurses or have had no occupation in 1965. Persons with nonprofessional nurse occupations in 1965 were excluded, irrespective of age. This procedure has undoubtedly eliminated a number of persons in

[3] A 5-year period is sufficiently long to permit several moves. Unfortunately, the census data allow one to capture *at most* one of these moves. It is possible a family could move from State i to State j and then back to State i by 1970. The census data would show no record of these moves.

[4] U.S. Department of Health, Education, and Welfare (1974), and an unpublished memorandum made available to the author by the Division of Nursing.

[5] A weaker set of screens has been used for the tables presented in appendix C.

other health professions, as well as (unavoidably) some persons who were truly nurses. Since the intent of screening was to purge the sample of persons inappropriately classified as professional nurses, and not to determine the actual number of nurses in the United States or in certain regions, the possibility that actual nurses have been excluded is not serious. No effort was made to assess the accuracy of current occupation of nurses' spouses or to eliminate observations that appeared to be inconsistent.[6]

Although data on earnings and several personal characteristics variables are from the census, most variables representing location-specific amenities are from non-census sources; these variables have been merged with the census data base for purposes of the empirical analysis.

Empirical Specification

The dependent variable is the probability that a nurse living in State i in 1965 lives in State j in 1970. All 48 States in the coterminous United States are considered as alternatives; thus, for a given State there are 47 alternatives for the nurse's 1970 location. Since the probability of staying in State i is known once the 47 migration probabilities are known, location-migration behavior is fully described by the 47 probabilities. The probabilities are derived by aggregating individual nurse records from the census. The regressions are based on a total of 2,256 probabilities [47 alternatives times 48 reference year (1965) States]. Since the sample size required to generate 2,256 probabilities with precision would be immense, weighted regression, with the weights being the number of observations in the State in 1965, has been used throughout the analysis. The explanatory variables are based on the classification scheme implied by equation (4.1). Unfortunately, the census data base does not permit one to assess migration responses to job-related amenities—the "N"-type factors; these are assessed in later chapters.

Economists have traditionally stressed the role of *earnings differentials* as determinants of migration flows. Unfortunately, however, most studies have not explicitly recognized that migration is a household decision, not a decision made by a single family member. It can be readily shown, with reference to

[6] It would be reasonable to ask why census data are being used for this analysis in the face of documented evidence of measurement errors. The main justification is that other data sources, although they identify nurses properly, are deficient in other respects. Either they are limited to a subgroup of nurses, as is the Survey of Registered Nurses which may be appropriately used in an analysis of nurse retention in current employment—chapter 6's topic, or they are limited in terms of the number of variables included, as is the Inventory of Registered Nurses. The latter data source is extremely useful for establishing the size of the nurse population, but has less value in many forms of multivariate analysis. As noted below, migration rates derived from the census are comparable to those derived from a longitudinal study based on the 1966 and 1972 Inventories of Registered Nurses.

econometric theory, that findings with regard to the importance of female earnings differentials may be quite sensitive to whether or not a male earnings differentials variable is also included in the migration regression.[7] Inclusion of separate earnings variables for adult male and female household members is a reasonably unique contribution of this chapter's empirical analysis.

The nurse earnings difference, which corresponds to the B element in (4.1), refers to interstate earnings differences of nurses working 50 to 52 weeks in 1969. Following the method discussed earlier, there are 47 earnings differences per State. As is true of all explanatory variables expressed in dollar terms, this variable has been deflated by a State price index (DFL1 in chapters 2 and 3). Earnings are defined for 1969; the migration decision takes place over the period 1965 to 1970.[8]

As (4.1) indicates, all explanatory variables should be defined for the expected duration of residence in the alternative location. In the case of earnings and job amenities, they should also reflect expected labor force participation for the expected duration of residence. As Altman (1971) and others have documented, married nurses in particular often spend a substantial proportion of their adult lives outside the labor force. By contrast, labor force participation of the vast majority of adult males tends to be reasonably continuous up to retirement age. Considering the labor participation factor, a differential of, say, $1,000 in earnings for a given year may mean much more in terms of expected lifetime earnings of the male than the same annual difference would mean in terms of expected lifetime earnings of the married nurse. Since the expected earnings difference is the product of earnings difference *and* the probability of working, low probabilities can substantially lower the expected value.

Several general migration studies have calculated present values of earnings differentials available in alternative locations, but both occupations and locations have been defined much more broadly than in this study. The Public Use Sample and other data bases simply contain too few observations to permit calculating present values of nurse lifetime earnings for each State. Geographic aggregates larger than the State introduce even more intralocational variation than occurs when the State is the observational unit. Thus, in this study, inferences concern-

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[7] See Mincer (mimeo.) for a more complete discussion of this point. DaVanzo (1972) is one of the only studies that considers earnings opportunities of husband and wife explicitly.

[8] It would have been desirable to define the earnings difference for a year more nearly the midpoint of 1965–70. Available data regretably do not allow this.

ing migration responses to nurses' earnings differentials are made from single year data.

The following method is used to approximate element B of equation (4.1). Earnings differences between alternative States j and the State of residence in 1965 are represented by the variable NWAGE. To account for variations in the expected labor force participation rate, WKL10 is included as a separate explanatory variable; it represents the fraction of nurses living in State i who worked 10 weeks or fewer in 1969, irrespective of whether they stayed in State i or moved elsewhere.

The second variable at least partially accounts for interstate differences in nurse labor force participation in the near term. It does not, however, take into account the fact that the overall labor force participation rate of nurses is likely to be below that of their spouses. Therefore, it is plausible to expect that the parameter estimate associated with the nurse earnings variable, although positive, should be lower than the corresponding variable for nurses' spouses. The lower parameter does not necessarily mean that nurses' opportunities are discriminated against in the household decisionmaking process. Rather, this result could well mean that a given differential, say $1,000 per annum, would be applicable as a rule to fewer years in the case of the nurse. For this reason, the nurse differential receives a lower weight.

The anticipated sign of WKL10's coefficient may be determined in the following way. Let p_{mt} and p_{ft} be, respectively, the probability that the male and female household members work. Then, assuming for purposes of developing the theory that the labor force participation probability is invariant with respect to the household's State and that all employed persons work full time if they work at all, elements A and B of (4.1) are:

$$(4.2) \qquad \sum_{t=1}^{n} \frac{p_{mt}(e_{mjt}-e_{mit})}{(1+r)^t} \qquad \text{and}$$

$$(4.3) \qquad \sum_{t=1}^{n} \frac{p_{ft}(e_{fjt}-e_{fit})}{(1+r)^t}$$

where e . . . is actual (as opposed to expected) earnings.

The variable NWAGE is $(e_{fj}-e_{fi})$. In constructing the variable in this manner, one assumes the *differences* will be the same for all t, an assumption that may not be bad as a first approximation. The probability p_{mt} is likely to be equal to or to exceed p_{ft} in most households with a married nurse. If, in a migration regression, β_m is the parameter associated with $(e_{mj}-e_{mi})$ and β_f with $(e_{fj}-e_{fi})$, β_m will exceed β_f even if a dollar in lifetime earnings attributable to the nurse is exactly the same as a dollar in lifetime earnings attributable to her spouse.

Now, one may subdivide married nurses into two categories: those with a high propensity to remain in the labor force, signified by the subscript "h"; and those with a low propensity, identified by the subscript "ℓ." By definition, $\beta_h > \beta_\ell$ since lifetime earnings are more sensitive to a given annual differential if the expected participation is high. As βf is an "average" of both groups of nurses, $\beta_f < \beta_h$ and $\beta_f > \beta_\ell$. Thus, if β_f is used instead of β_h and β_ℓ, the resulting equation will systematically overpredict the propensity to move in response to a positive annual nurse earnings differential in the case of the "ℓ" nurse, and underpredict in like circumstances in the case of the "h" nurse. When included, the variable WKL10 may be expected to pick up this influence, which otherwise would fall in the residual term. As defined, WKL10 is one for the "ℓ" category and zero otherwise, and, in view of the preceding argument, it is anticipated to have a positive impact on the propensity to move.

As documented in Knopf (1975) and in appendix C, nurses' spouses are in a wide variety of occupations, and the status of these occupations is higher than for American males on the whole. In assessing the impact of spouse earnings differentials, it is important to consider what spouses living in State i in the base period potentially could earn in alternative States.

The spouse earnings differential variable SWAGE captures the earnings potential of spouses resident in their respective 1965 States as accurately as possible. The Census Bureau has published estimates on the median 1969 earnings of males working 50 to 52 weeks in 1969 by State according to a three-digit occupational classification. In a few high earning occupations, earnings data are unavailable by occupation *and* State. Observations affected in this way have been entirely eliminated from the empirical analysis.

To illustrate the method, assume there are three nurses' spouses in State Dixie and four nurses' spouses in State Yankee in the same year. Conceptually, it is desirable to ascertain what the spouses in Dixie and Yankee could have earned, respectively, if they were to have moved to any of the other 47 States. Assume the occupation distribution of nurses' spouses for Dixie is: one college professor, one farmer, and one insurance agent. For Yankee, the distribution is two automobile repairmen, one engineer, and one chemist. The spouse earnings differential variable is constructed so that in comparing the other States to Dixie, Dixie's occupational mix is held constant. If Yankee is State j and Dixie is State i, SWAGE is the difference between earnings in the two States, assuming Dixie's occupational mix. When Dixie is j and Yankee is i, Yankee's occupational mix is used. In this way, it

is possible to represent the earnings opportunities of decisionmakers more precisely than in virtually any other migration study.

Since male labor force participation is essentially universal, there is no reason to include a participation variable for males analagous to WKL10. There is, however, another consideration. A number of occupations have a market in almost every community; e.g., bookkeepers, mechanics, barbers, and so on. In fields requiring considerable formal education, job opportunities tend to be concentrated in fewer locations—college professor is limited to communities in which there is a college. For this reason, persons with a relatively high educational attainment may find it advantageous to make short moves less frequently; and conversely, more distant, often interstate, moves are likely if the person moves at all.[9] The variable SPROF is the fraction of spouses living in the 1965 State with 6 years or more of formal schooling past high school. One expects spouses in this category to have a higher propensity to make interstate moves, holding other factors constant, because interstate moves are likely to constitute a higher proportion of total moves.

The variable for population differences between States j and k, POP has a similar role in the migration equation. There are likely to be more job opportunities for persons in *all* occupations in the more populous States. Moveover, more persons are likely to have had prior contact with these States, e.g., have friends and relatives there.

Theory is not really helpful in determining specific *amenities associated with particular locations* that households containing professional nurses are likely to value (referring to (4.1), the "R" variables). Judging from the migration propensities of the U.S. population as a whole, and from those of households with nurses, it appears that States with warm climates have increasingly become attractive.[10] The variable TEMP, measured by State differences in the number of days the minimum temperature is 32° F or less, accounts for this factor. Given the way TEMP is defined, the variable is expected to have a negative impact on the probability of moving from State i to State j.

Two variables, RAPE and AUTO—differences in the number of forcible rapes and auto thefts per 100,000 population, respectively—represent the influence of crime as a locational determinant. As is well-known, crime data are subject to a number of measurement errors. Moreover, there is a substantial amount of intrastate variation in criminal activity, and the mean for the

[9] See Schwartz (1976) for a conceptual treatment of this point.

[10] Movements to warmer climates are evident in table C–4 of appendix C.

State may not be an accurate indicator for specific areas within a State. However, since the Census Public Use tapes do not reveal respondent location below the State level for reasons of respondent confidentiality, there is no alternative but to use State crime information.

To a considerable degree, the problem of intrastate variation also applies to the pollution measure SUSP. This difference variable is based on the value of the mean level of suspended particulates in the largest city in the State. While not ideal, this measure may not be as poor as it appears at first glance, since air pollutants are known to travel from highly urbanized to rural areas (as, for example, in southern California).

There is substantial interstate variation in real [11] State-local government expenditures per capita population. While the direction of the vast majority of explanatory variables discussed in this section can be determined *a priori*, it is not known whether the government expenditure variable (also expressed in differences) should have a positive or a negative impact on the probability of migration. The sign depends on the value nurses and their families attach to public as opposed to private goods. To the extent that nurses and their families, being highly educated, as a group, relative to the U.S. population as a whole, place a high value on certain public programs (e.g., those related to education, health, and cultural opportunities), the government expenditure difference variable EXPEND should have a positive effect. However, in spite of widespread criticisms that taxation by State and local governments tends to be regressive, there is substantial interstate variation in the tax burdens on middle and high income families. Households with nurses simply may not be willing to pay the price in terms of private goods foregone.

The variable MET is the difference in the fraction of persons living in metropolitan as opposed to nonmetropolitan areas. The term "metropolitan" coincides with the Standard Metropolitan Statistical Areas. Assuming nurses and their families prefer urban living, the parameter estimate associated with MET should be positive.

As Greenwood's (1975, p. 411) recent review of the migration literature noted:

> One of the clearest implications of the related literature is that gross migration declines perceptibly with increased distance. What remains unresolved is the relative importance of various economic and non-economic factors for which distance is a proxy. However, most estimates of the earnings gains associated with dominant migration streams suggest that these gains are substantial enough to more than offset any reasonable direct transport costs

[11] Adjusted for area differences in the price level.

associated with distance. Hence, to a large extent distance must reflect the importance of *psychic and informational costs.* (emphasis added.)

Schwartz (1973) reported that the deterring effect of distance declines markedly with education, holding age constant. Empirical results of earlier studies (Folger and Nam, 1967); and Suval and Hamilton, 1965) support Schwartz's finding.

Schwartz used an ingenious approach in an attempt to ascertain whether observed distance effects primarily reflect costs of obtaining information that presumably rise with distance or psychological costs that may also be distance-related. Since his work is instructive in terms of understanding the role of distance in the migration equation developed in this chapter, it is discussed here in some detail.

There are numerous potential sources of job opportunities: friends, relatives, colleagues, placement offices, advisors, local communication media, and so on. Schwartz argued that the less sophisticated the method by which information is sought, the greater decrease there will be in the amount of information available to the decision-maker as distance increases. Education increases a person's capacity to process published information and use long distance communication methods effectively. Thus, if Schwartz is correct, one should observe that the migration patterns of the relatively educated are less associated with distance. On the other hand, there is no reason to believe that the ability to gather information about distant market opportunities improves with age.

As to the psychological costs associated with a move, one admittedly crude way to express these would be to compute the transportation cost over the duration of residence in the alternative location needed to offset the distress of being away from relatives and friends. This type of cost clearly rises with distance. Schwartz argued that this cost is positively related to age. Comparatively older persons have, as a rule, invested more time establishing relationships with family and friends and, therefore, the disutility of a breakup is greater. By contrast, the case for increased disutility with higher educational attainment is weak at best.[12]

Schwartz's findings that (1) the importance of distance diminishes with the individual's level of education, and (2) the psychological cost of distance is positively related to age were used by him to support his conclusion that the adverse impact of distance on migration is essentially a diminishing-information

[12] Schwartz admitted that persons with a lower psychological cost of moving may select occupations that are likely to require a move.

phenomena. An alternative view, however, is there tend to be fewer "slots" for a highly educated person within many localities, a point developed in Schwartz's (1976) article. If so, the observed relationship between distance of the move and education may have relatively little to do with information costs.

Since the sample used in this chapter is comparatively homogeneous with regard to education, in that all households contain a nurse, the "slot" phenomenon is likely to be relatively more important than information. Evidence to date is certainly not sufficiently strong to rule out increasing psychological costs with distance. Distance in this study (DIST) is measured in terms of the number of air miles from the geographic center of State j, the alternative State, to the center of State i, the 1965 State of residence.

Psychological costs associated with a move are likely to be higher if there has been extensive contact with one's current location. Ideally, one would like to have data on the individual's location at various stages in life prior to the time the migration decision is made. Unfortunately, the census only records the State of birth. The variables NBST and SBST represent, respectively, the fraction of nurses and spouses who, as of 1965, were living in their State of birth.

Moving means that children must change schools, which is thought to have both educational and psychological impacts. The variable KIDS is the fraction of households with children over 6 years of age living at home as of 1970. The variables SPGRP1 through SPGRP5 are included to account for any household background effects unaccounted for by the other explanatory variables. These variables are defined according to whether or not the nurse was a nurse in 1965 and whether or not there are *any* children in the household as of 1970.

For purposes of the multivariate analysis, households have been stratified by nurse age and marital status. As table 9 indicates, the percentage of nurses ages 46 and over (as of 1970) who left their 1965 State in the 1965–70 period is quite small, around 5 percent. Migration of professional nurses in this age category cannot be depended upon as a potential source of nurses for "underserved" areas. Although 12.7 percent of nurses in the unmarried 33 to 45 age group moved among the States in the 1965–70 period, there is an insufficient number of observations to permit an analysis parallel to one for married nurses in the same age group. Although the census data base's deficiencies have already been emphasized, it is worth noting the consistency between the overall outmigration rate of 14.0 percent in table 9 with the outmigration rate of 15.5 percent, derived from a lon-

Table 9.—Percentages of professional nurses leaving their 1965 States by nurse category [1]

Category	Percentage leaving State	Number of *observations*
1. Married, under age 33, RN in 1965, no children	24.8	137
2. Married, under age 33, not RN in 1965, no children	31.4	392
3. Married, under age 33, RN in 1965, children	19.2	771
4. Married, under age 33, not RN in 1965, children	20.4	833
5. Not married, under age 33, RN in 1965, no children	26.7	135
6. Not married, under age 33, not RN in 1965, no children	25.2	281
7. Married, age 33 to 45, RN in 1965, no children	10.0	190
8. Married, age 33 to 45, RN in 1965, children	10.1	1,896
9. Not married, age 33 to 45, RN in 1965, no children	12.7	181
10. Married, age 46 to 60, RN in 1965, no children	4.8	693
11. Married, age 46 to 60, RN in 1965, children	5.6	447
12. Not married, age 46 to 60, RN in 1965, no children	4.5	441
All of the above RNs	14.0	6,397

[1] Age is defined with reference to 1970.

gitudinal study of professional nurses based on the 1966 and 1972 Inventories of Registered Nurses.

Empirical Results

Migration equations are estimated for three categories of professional nurses: group 1, married and under age 33; group 2, married and age 33 to 45; and group 3, not married and under age 33. The explanatory variables SBGRP are defined in the same manner as in table 9.

Concise definitions of the migration regression variables are given in table 10. Table 11 presents the regression results and mean values for the undifferenced variables for these three categories of nurses. The coefficients of determination (R^2s) are low, but the F-tests for the significance of the overall relationship are statistically significant at above the 1-percent level. Al-

Table 10.—Concise definitions of migration regression variables

Variables	Definitions
NWAGE	[1] [2] Difference in annual median RN earnings
SWAGE	[1] [2] Difference in annual median male spouse earnings
DIST	Miles from center of State j to center of State i
TEMP	[1] Differences in mean number of days per annum the minimum temperature is 32° F or less (measured with respect to State's largest city)
POP	[1] Difference in population (expressed in '000s)
RAPE	[1] Difference in rapes per 100,000 population
AUTO	[1] Difference in auto thefts per 100,000 population
SUSP	[1] Difference in mean suspended particulate matter (measured with respect to State's largest city)
EXPEND	[1] [2] Difference in State-local government expenditures per capita
MET	[1] Difference in fraction of State population living in metropolitan areas
NBST	Fraction of RNs in 1965 State who were born in that State
SBST	Fraction of male spouses in 1965 State who were born in that State
SPROF	Fraction of male spouses in 1965 State with 6 years or more of formal education past high school
KIDS	Fraction of households in 1965 State with children over 6 years of age living at home in 1970
WKL10	Fraction of RNs in 1965 State working fewer than 10 weeks in 1969
SPGRP1	[3] Fraction of married RNs under age 33 in 1970 who were *not* RNs in 1965 and have *no* children in 1970
SPGRP2	Fraction of married RNs under age 33 in 1970 who were RNs in 1965 and have children in 1970
SPGRP3	Fraction of married RNs under age 33 in 1970 who were *not* RNs in 1965 and have children in 1970
SPGRP4	Fraction of married RNs age 33 to 45 in 1970 who were RNs in 1965 and have children in 1970
SPGRP5	Fraction of single RNs under age 33 in 1970 who were *not* RNs in 1965 and have no children in 1970

[1] Difference between State j (alternative State) and State i (State of residence in 1965).
[2] Deflated by a State price index described in Steinwald and Sloan (1974).
[3] The variables SPGRP1 through SPGRP5 are defined with reference to the State of residence in 1965.

though the data have been grouped to form the migration probabilities, group cell sizes are generally small. The low R^2s and high F-values on the regression equation are frequently found when the observational unit is an individual or, as in the case of these regressions, small aggregates of individuals.

The principal findings of the regression analysis are as follows. Nurse earnings differentials have a negative rather than the expected positive impact on the probability of moving to State j from State i. By contrast, spouse earnings differentials demonstrate the expected positive impact; and the associated parame

Table 11.—Migration regressions [1]

Explanatory variables	Group 1	Group 2	Group 3
NWAGE	[3] −0.00135	−0.00034	−0.00084
	(0.00047)	(0.00029)	(0.00070)
SWAGE	[3] 0.00240	[3] 0.00106	—
	(0.00061)	(0.00035)	(—)
DIST	[3] −0.0126	[3] −0.00534	[2] −0.00633
	(0.00157)	(0.00090)	(0.00292)
TEMP	−0.00548	−0.00503	−0.01297
	(0.00662)	(0.00387)	(0.01139)
POP	[3] 0.00029	[3] 0.00012	[3] 0.00050
	(0.00006)	(0.00004)	(0.00012)
RAPE	[2] 0.1170	0.0571	0.0949)
	(0.0446)	(0.252)	(0.0737)
AUTO	−0.00124	0.00099	0.00651
	(0.00180)	(0.00107)	(0.00337)
SUSP	[2] −0.01262	−0.00600	0.00244
	(0.00576)	(0.00320)	(0.01085)
EXPEND	−0.00418	−0.00224	0.00113
	(0.00263)	(0.00159)	(0.00492)
MET	0.746	−0.467	0.319
	(2.06)	(1.19)	(3.49)
NBST	−3.70	2.22	−0.809
	(3.75)	(2.05)	(3.15)
SBST	−6.33	[3] −6.86	—
	(3.85)	(2.19)	(—)
SPROF	9.19	5.71	—
	(5.64)	(4.02)	(—)
KIDS	[3] −12.69	−1.26	—
	(4.66)	(5.30)	(—)
WKL10	[2] 10.39	1.48	—
	(4.54)	(2.92)	(—)
SBGRP1	−5.85	—	—
	(9.22)	(—)	(—)
SBGRP2	−8.22	—	—
	(7.86)	(—)	(—)
SBGRP3	−2.53	—	—
	(8.14)	(—)	(—)
SBGRP4	—	4.81	—
	(—)	(7.36)	(—)
SBGRP5	—	—	[3] −13.94
	(—)	(—)	(4.42)
CONSTANT	20.90	3.12	22.04
	(—)	(—)	(—)
	R^2=0.09	R^2=0.05	R^2=0.05
	F(18,2237)=	F(16,2239)=	F(12,2243)=
	[3] 11.78	[3] 7.22	[3] 9.16

[1] All regression coefficients and associated standard errors in this table should be divided by 1,000.
[2] Means significant at the 5-percent level (two-tailed test).
[3] Means significant at the 1-percent level (two-tailed test).

ter estimates are statistically significant at the 1-percent level. Although SWAGE and NWAGE are positively correlated (r=0.52 and r=0.51, for the first and second groups, respectively), the correlation is far less than 1.0. Furthermore, although data on nonpecuniary aspects of the job are unavailable for *both* the nurse and her spouse, it is reasonable to presume this correlation would be for less than unity as well. While the negative sign might be attributed to multicollinearity (a high correlation between NWAGE and SWAGE), it is doubtful this is a major source of the observed pattern in this instance. First, the simple correlation between the migration probability and NWAGE is negative for both groups, while the corresponding simple correlation involving SWAGE is positive. Second, the NWAGE parameter estimate is insignificant but negative in the third regression, which is based on a sample of unmarried nurses.

There are at least two possible explanations. First, in the case of married nurses, the number of years in which the nurse expects to be active is small relative to the expected duration of residence, particularly in relation to the spouse's expected labor force participation. As indicated previously, a lower mean participation rate is associated, other factors being constant, with a lower earnings differential parameter estimate. Potential earnings advantages accruing to the spouse could consistently dominate those accruing to the nurse. This explanation, however, is not satisfactory for unmarried nurses for whom the labor force participation rate is more nearly 1.0, and for whom no other important source of earned income exists. Second, the "wedge" introduces a degree of indeterminacy into the analysis. Only when the values of elements A through E outweigh the wedge does the decision-maker move. If potential earnings gains to nurses from moving are small, there may be very few situations indeed in which this variable provides the reason for overcoming the wedge threshold. Intuitively speaking, imagine a family with very high psychological costs of moving. The nurse family member knows she could earn $1,000 more per annum if the family moved to State j (which was a sizeable difference in 1965–70 dollars); and she expects to work about 5 out of the next 10 years, starting 4 years from now. Discounted at a rate of 7 percent, the percent value of this differential would be $3,347. For the spouse who is likely to work continuously, the same $1,000 differential would be $7,023. The question is whether $3,347 per se could cover the transactions costs of moving (i.e., the wedge).

The positive coefficient associated with WKL10, significant in the regression for the younger group of married women, implies that labor market activity on the part of the nurse actually

deters moves.[13] Two new and satisfactory jobs are apparently more difficult to find than one.

Judging from the positive parameter estimates on the SPROF variable, it appears that families with highly educated spouses are indeed more likely to make interstate moves. Probably the most plausible reason for this is there are comparatively few "slots" for these individuals in a particular locality, necessitating more distant, interstate moves. It is not possible, however, to rule out Schwartz's contention that this pattern reflects relative information costs.

The population difference variable has a statistically significant effect on the migration probability in all three regressions. As discussed previously, the mechanism underlying this variable is similar to SPROF's.

Again, in chapter 2, location characteristics variables do not perform well on the whole. The temperature difference (TEMP) coefficients suggest that nurses and their families, holding other factors constant, have a lower probability of moving to colder States. The coefficients, however, are not statistically significant at traditional levels even though their signs are plausible. Likewise, judging from the negative signs of the parameter estimates on the suspended particulate variable (SUSP), households with nurses are less likely to move to polluted areas. The lack of significance is again cause for caution in interpreting these results.

The crime difference variables (RAPE and AUTO) were expected to have negative impacts on migration; however, no definite pattern was found in the regressions, which is probably the result of errors in measurement and within State heterogeneity, particularly with regard to crime. The difference in the metropolitan proportions variable (MET) demonstrates no effect on migration; again, this is probably due in large part to the correlation between MET and POP. It was not possible to determine the direction of State and local government expenditure per capita (EXPEND) in advance; and the regressions are ambiguous on this score.

Findings with regard to the wedge variables are clearer. The impact of distance is unambiguously negative. Elasticities evaluated at the observational means are −0.84, −0.89, and −0.38 for the three regressions, respectively. According to these elasticities, the deterrent effect of distance is about the same for the two groups of married nurses; and married nurses, not surpris-

[13] In this sense, the nurse's work ties the family to its present location. For an extensive discussion of "tied" mover-stayers as the concept applies here, see Mincer (mimeo.)

ingly, are far more adverse to moving long distances than are their unmarried colleagues. These findings are consistent with Schwartz's (1973) research on the deterrent effects of distance, which showed distance's impact to be invariant with respect to the individual's age.

As judged by the coefficients of NBST and SBST, previous attachment to the State appears to be particularly important for the spouse rather than the nurse. There are at least two explanations for this. First, the husband may have a dominant role in family decisionmaking; that is, his psychological costs are given a disproportionate weight. Alternatively, spouses with previous attachment may tend to have greater earning potential in their home States than elsewhere. This may stem, for example, from a family business, or from professional contacts established while in school. The advantages of previous contacts do not, as a rule, hold for nursing.[14]

The impact of school-age children (KIDS) is negative in the case of married nurses under age 33, and no effect is evident for the second group. The results suggest the psychological costs of moving are somewhat lower in the case of older children. The SBGRP variables generally demonstrate no impact on migration. It is clear from the constant terms, as from table 9, however, that migration probabilities are substantially higher for the younger age group. If age had been included as an explanatory variable in a regression based on nurses in all age groups, it would have undoubtedly been statistically significant. Age more than the presence of children per se appears to relate closely to the psychological cost of moving and to the fact that any returns to migration are likely to be of a shorter duration.

Implications and Conclusions

We posed five questions at the outset of this chapter. Based on our empirical analysis, there are the answers. As is usual in empirical studies, some answers merit more confidence than others.

First, we asked whether interstate differentials in wages offered nurses partially explain interstate migration of nurses. Do nurses tend, other factors constant, to move to States in which their earning potential is relatively high? Our empirical results suggest no response on the part of nurses to wage differences.

Second, we inquired about interstate movements of nurse families in response to financial opportunities available to

[14] Comparative earnings of migrants and nonmigrants in a given locality have been the topic of several studies. See, for example, Lansing and Morgan (1967) and Masters (1972).

nurses' (male) spouses. We find nurse families do move to areas in which spouses can earn more. We have suggested an economic rationale for this pattern. But economics can only account for part of the story. Sociological forces are also undoubtedly important, and our analysis has been unable to capture these. Women in the 1970's appear to be exercising greater influence in family decisionmaking. It is by no means clear that analysis based on 1980 census data would reveal the same patterns observable from 1970 census data. Yet, it is safer to base conclusions on results from in-depth empirical studies rather than from impressions. These issues merit reanalysis with a more recent data base.

Third, we sought to determine the role of previous attachment of the nurse to a State as a factor in the location decision. If nurses and/or other family members stress contacts with relatives and existing friends, they will be reluctant to consider alternative States. From the vantage point of policy, this would be useful to know, because large numbers of graduates of nursing schools within the State would tend to remain there. We discovered that previous attachment to State appears to be particularly important for the spouse rather than the nurse. This result is, certainly consistent with our second finding. To the extent nurses marry men from their home States, it does not really matter for policy purposes whose contact receives most weight. But if the spouses come from other States, our results imply that retention within the State will be adversely affected.

Fourth, we inquired about the role of distance. Are nurses and their families more reluctant to move to distant States? We find they are. Of course, cross-country moves often occur, but our results imply that, holding other factors constant, they occur less frequently.

Fifth, we attempted to identify important characteristics of States that are comparatively successful in attracting interstate migrant nurses. This aspect of our work is a continuation of our issue analyzed in depth in chapters 2 and 3. In general, our analysis of this fifth topic has produced inconclusive results; one reason may be there is a great deal more intrastate variation in such area characteristics as crime rates and pollution; thus, no consistent pattern emerges from a study with the State as the observational unit.

Findings presented in *The Geographic Distribution of Nurses and Public Policy* (Sloan, 1975) implied that professional nurses are mobile as a group and that nurses should be recognized as a national resource. This chapter's evidence would, at least superficially, appear to point in the other direction. Furthermore, in-

terstate migration of nurses is found *not* to be responsive to economic opportunities; nurse labor force participation is in fact seen as a deterrent to the family's mobility; households containing nurses are more reluctant to move long distances than shorter ones; previous attachment to the State, especially on the part of the nurse's spouse, tends to inhibit interstate movements.

However these findings and associated implications really do not contradict the earlier findings. It is a matter analogous to "the glass as half-empty or half-full" cliche. Over time, there is a considerable amount of geographic movement; but the geographic movements of nurses are not purposeful with regard to market opportunities for nurses. Furthermore, while distance is a deterrent factor, it is certainly not an absolute barrier. The pattern between nurse mobility and age, noted in Sloan (1975), is found again: Most moves occur in early adulthood; and by the midforties, interstate movement of professional nurses is virtually nil. The results are consistent with Payne and Yett (1971) who found, using a sample of Los Angeles hospital nurses, that married nurses mostly make family-related moves (presumably in response to spouse opportunities), while single nurses move for reasons other than family. According to Payne and Yett, neither married nor single nurses move in response to nurse earnings differentials.

The result imply that financial incentives to induce nurses to work in specific locations are not likely to succeed. The implications for publicly subsidized nursing education are possibly more favorable. Although a meaningful percentage of locally trained nurses are likely to leave for other States and/or regions, a reasonably high proportion tend to stay. Albeit costly, it is a much more certain way of assuring an increased number of nurses than is the financial route. Given the results on distance, regional contracts for purposes of nursing education, such as the Western Interstate Commission for Higher Education, are reasonably attractive as well.

Although the findings presented in this chapter imply that financial incentives provide important inducements for interstate moves in the case of the spouse but not the nurse, the evidence does not necessarily suggest that professional nurses are fully unresponsive to "economic" incentives. Such incentives may be important in the choice of an employer within a fairly circumscribed geographic area. Furthermore, wages may affect work hours. Likewise, one should be hesitant in rejecting the role of location-specific amenities on the basis of evidence presented here, since problems in their measurement may have obscured underlying relationships. The census data base does not allow

one to examine the importance of nonpecuniary job-related factors as locational determinants, although the Survey of Registered Nurses contains some information needed for an assessment on this type. Empirical analysis based on this survey is chapter 6's topic.

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Chapter 5

MATCHING PROFESSIONAL NURSES AND JOBS: THE RECENT NURSING SCHOOL GRADUATE

Frank A. Sloan

Introduction

As we and others have shown, professional nurses are relatively mobile at early stages in their careers. For this reason, the major policy instruments concerned with the aggregate supply of nurses *and* their distribution should be directed toward nursing education. Thus, the process by which nurses and jobs are matched is potentially of major policy interest.

This chapter is principally concerned with five issues:

(1) To what extent do nurses invest time and effort to obtain information about potential employers? Unless nurses in general and recent graduates in particular are knowledgeable about job opportunities, specific offerings may not be effective employment inducements, at least in the short term (although, in the longer run, such inducements may matter, but at the cost of substantial turnover). As an alternative to actively seeking a good job, the nurse may take any job, only to leave after she determines, in retrospect, her choice had been inappropriate. This retrospective method of job search could place a burden on hospitals in "underserved" areas, because comparatively few nurses would make the effort to learn about any special inducements they might offer.[1]

(2) What do nurses seek in their prospective employment? Job attributes include both financial and nonfinancial offerings. Since nurses may be expected to differ in the job attributes they value most, it is essential to ascertain the kinds of job attributes that attract different nurses. Some may primarily desire financial rewards from employment; others may stress educational opportunities or various aspects of their working conditions; while still others may make few demands regarding their prospective job, because they expect the duration of their employment to be short in any case.

(3) What factors distinguish professional nurses who devote a substantial amount of time and effort to job search from those

[1] See Stephenson (1976) on job search and duration of unemployment, and planned tenure of next job.

who do not? Do nurses with specific kinds of career objectives search more? Does her desirability as a job candidate have an effect on the extent and duration of a nurse's search? Reasons for anticipating that professional nurses with "better" credentials have both longer and shorter search periods can be advanced.

(4) What are the marginal returns to the nurse from extended job search? Do nurses who search more earn more?

(5) Conversely, does the length of time the nurse is unemployed, during which job search presumably continues, have the effect of lowering the starting wage she will accept? Empirical evidence reported by economists suggests that the "reservation wage" (the lowest wage a person will take in order to accept employment) falls as the duration of unemployment lengthens.[2]

According to economic theory, decreases in the prospective employee's reservation wage provide a means whereby supply and demand sides of the labor market reach an equilibrium. While adjustments with respect to wages provide one method for establishing an equilibrium, it is by no means the only one. The employer may keep the wage scale constant, but alter the quality or level of labor hired at each point along the scale (Hall, 1974; Reder, 1955). Thus, in recessions, employers may be more "choosy" in selecting employees, rather than lower wages. Upgrading requirements for a specific dollar wage is also, of course, equivalent to lowering the real wage. Rather than lower their reservation wage, prospective employees may compromise on particular aspects of the job; e.g., move from their current location, work in a less desirable neighborhood, or less desirable hours, or with a less pleasant supervisor.

From the vantage point of policies aimed at the geographic distribution of professional nurses, it is important to ascertain whether compromises with regard to location are near the first or near the last of the sacrifices nurses are willing to make. Referring to chapter 4's conceptual framework, also applicable here, the nurse's propensity to move depends on the size of the "wedge." Equivalently, her willingness to work on the night shift depends on other types of costs; i.e., the cost of finding substitute help at home, as well as psychological factors.

These five issues are analyzed in detail in the next sections of this chapter.

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[2] See Kasper (1967), Barnes (1975), Stephenson (1976). As noted by Stephenson (p. 104), several reasons have been given for the decline in the reservation wage as a function of unemployment duration: "(a) a finite time horizon (Gronau, 1971), (b) progression from more promising to less promising job possibilities (Salop, 1973), (c) a fall in the marginal utility of leisure (Kasper, 1971), (d) higher psychic and anxiety costs (Holt, 1970), (e) the depletion of assets and savings (Kasper, 1967), and (f) greater risk propensity (Harnett, Cummings, and Hughes, 1971)."

The Data

The data in this chapter are drawn from a survey of newly licensed professional nurses conducted by the National League for Nursing (NLN) during 1973, with funds provided by the Division of Nursing.[3] To obtain the sample, the NLN randomly selected names of nurses who had successfully passed their licensure examinations in the recent past. A total of 8,000 newly licensed nurses—6,000 registered nurses and 2,000 practical nurses—were sent mail questionnaires. Of these, 275 were returned as undeliverable; of the 7,725 deliverable questionnaires, 6,223 were completed, for a response rate of 80.6 percent, which is very respectable for a mail questionnaire. A study conducted by the NLN of nonrespondents showed that basic characteristics of nonrespondents did not differ in a meaningful way from those of respondents.

The response rate of registered nurses to the questionnaire is somewhat higher than the combined RN and LPN rate; and the analysis in this chapter is limited to registered nurses. The questionnaire focused on:

1. The availability of nursing employment to newly licensed nurses.
2. The kinds of nursing employment in which the job opportunities were most numerous.
3. The degree and basis for selectivity exercised by nurses in choosing their initial employment.
4. The extent of geographic mobility exhibited by nurses in selecting initial employment.
5. The length of time unemployed before taking initial permanent employment.
6. The sources of job information available to and utilized by nurses. (Nash, 1975, p. 2.)

Some of the discussion in this chapter summarized pertinent material in Nash (1975) in order to (1) place Nash's information within a conceptual framework, and (2) emphasize the implications for the spatial distribution of professional nurses.

The NLN data will also be employed in this chapter's multivariate analysis. The Nash study relies exclusively on cross-tabulations. The primary disadvantage of tabulations is it is difficult to isolate the individual effects of several explanatory factors on a dependent variable. For example, in the Nash study, there were many comparisons involving baccalaureates, diplomates, and associate degree recipients. Yet, as the author acknowledged, nurses with differing types of educational prep-

[3] A more detailed description may be found in Nash (1975).

aration differ with regard to such important demographic characteristics as age, marital status, and children. The latter factors, rather than the type of program per se, may be responsible for many of the observed differences in subsequent career patterns.

Although multivariate analysis is preferable on balance, there is a justification for Nash's method. It is possible that the type of degree obtained (baccalaureate versus associate degree, for example) is more important to the prospective nurse than is the occupation of nursing itself. Some prospective nurses may obtain a baccalaureate because they desire a more general education. If they had not enrolled in a baccalaureate nursing program, they might have selected another "helping" profession, also requiring a baccalaureate and/or advanced degree, such as teaching, social work, or clinical psychology. A nursing diploma may not be considered a viable alternative to such persons. In this sense, by expanding nurse baccalaureate programs, one essentially changes the demographic mix of the nurse labor force in important ways, and it is useful to ascertain the implication of this type of expansion.

Characteristics of the Market for Newly Licensed Nurses

The process of looking for work is seen by economists as a productive activity in which persons are placed in jobs in which they are likely to be most productive. Being unemployed may allow the individual more time to evaluate alternative employment opportunities than being employed would permit. Given that job search is productive and may be more adequately performed when the person is without employment, virtually no economist would argue that the optimal unemployment rate is zero.[4]

As of 1973, the year the NLN Survey was conducted, the unemployment rate for newly licensed nurses was small—3 percent for baccalaureate graduates, 4 percent for associate degree graduates, and 2 percent for diploma graduates (Nash, 1975, p. 21). These percentages are substantially lower than the 5.8 percent national unemployment rate at the time the survey was conducted. The unemployment rate for diplomates is probably lower, because these nurses have a greater propensity to continue employment in the same setting in which they received their professional training. The fact that a nurse remains in the same setting represents in itself a conscious choice of employer.

The concept of unemployment often has relatively little meaning for females, because many who experience difficulties in

[4] The most comprehensive reviews of the job search literature are Lippman and McCall (1976a, 1976b).

obtaining employment withdraw from the labor force and are consequently recorded as nonlabor force participants, rather than as unemployed. Labor force participation rates of newly licensed nurses tend, however, to be unusually high for both nurses *and* adult women in general. According to Nash (p. 20), "graduates from AD (associate degree) programs are slightly more likely to withdraw from the labor force (4.5%) than are baccalaureate graduates (4%) or diploma graduates (2.6%)." Searching among alternative employers while unemployed is thus clearly not the rule among nurses in the NLN sample; typically, alternatives are evaluated during the last few months of the nurse's course of study.

The NLN survey asked the nurse to indicate the distance of the *farthest* place to which she applied for her first licensed position from her permanent address at the time of graduation. The nurse was given two options: (1) "within local community distance," and (2) "a distance which would have required me to move." Almost 72 percent of RNs responded "within local community distance." At least at that stage of the life cycle, most nurse job search appears to be confined to a rather small geographic area.[5] Evidence presented by Sloan (1975), based on the University of Florida's Survey of Registered Nurses, indicated that a large proportion of interstate moves are concentrated within the first few years after graduation from nursing school, but that nurses generally take their *first* job in the same geographic area in which they completed their training. Unfortunately, no data are available to allow one to ascertain whether nurses search for second (and subsequent) jobs over a larger geographic area. Moreover, it is not known whether they move for other reasons, such as family, and then search over a rather circumscribed geographic area in their new locations. Certainly evidence from the previous chapter would support the view that the latter pattern is the more dominant one. The fact that the majority of professional nurses (at least newly licensed graduates and certainly nurses in their thirties and older) do not search over a wide geographic area is a source of monopsony power for hospitals.[6]

Other dimensions of search include the time span over which search takes place and the number of nursing positions actively pursued. Considering nurses employed on a full-time basis at the time of the NLN survey, the mean length of time over which jobs were actively pursued prior to securing employment was 3.6

[5] This estimate is based on my own calculations from NLN survey data.

[6] The pattern with respect to nurse mobility after school is completed is also evident at the time of entrance to nursing school. According to my estimates derived from the NLN survey, slightly over 83 percent of recently licensed RNs attended nursing school within 100 miles of their homes; fewer than 3 percent went to school over 500 miles away.

weeks. The mean number of positions actively pursued (cases in which the nurse submitted a resume or had an interview) during this time period was 3.6. Eliminating nurses who stated they knew where they were going to work and therefore did not actively pursue jobs other than the one they took, the corresponding means are 4.6 and 3.0. Using either set of means, it is apparent that job search at this stage in the nurse's career tends to be intensive over a relatively short time period and over a rather circumscribed geographic area.[7]

Nurse Demand for Specific Job Attributes

The NLN survey asks the nurse to recall from a list of items provided on the questionnaire, job attributes that were important in her decision to accept her first nursing position. For each item, she was given the choice of five responses: "very important; quite important; of some importance; not at all important; does not apply." Job attributes listed in the survey were: "(1) closeness to family; (2) closeness to friends; (3) reasonable travel time between home and work; (4) type of neighborhood in which job is located; (5) orientation program given by employing institution; (6) inservice education; (7) work environment; (8) salary and fringe benefits; (9) ability to continue higher education in nursing while working; and (10) other." [8]

Table 12 gives the percentages of professional nurses who regarded specific job or employment attributes as being "very important" and "not at all important," i.e., polar responses. Judging from this table, it appears respondents placed the greatest emphasis on "work environment," which presumably includes hours of work, pleasant colleagues and supervisors, and interesting and challenging work. "Salary and fringe benefits" was a distant second. "Closeness to family" elicited intense preferences in its favor, but this attribute was on the other hand, unimportant to a large number of nurses. It is plausible to expect that nurses who place a high value on "closeness to family" are comparatively immobile. "Closeness to friends" appears to be the least valued on the list, followed by "type of neighborhood in which job is located." "Reasonable travel time between home and work" also appears important to newly licensed nurses, but there is a conceptual problem with this item. In many cases, the nurse could adjust her residence to the job's location; newly licensed nurses,

[7] For purposes of the regressions with job search dependent variables, presented later, the NLN data base has been screened to eliminate nurses (1) employed in their first jobs fewer than 35 hours per week (2) who searched for their first position as an RN graduate for more than 17 weeks and (3) who either said they actively sought no position upon graduation or actively sought more than seven positions.

[8] The entire questionnaire is reproduced in Nash (1975), pp. 125–132.

Table 12.—Percentage of professional nurses regarding specified job attributes as being "very important" and "not at all important" [1]

Job attributes	Percentage "very important"	Percentage "not at all important"
Closeness to family	22.6	21.8
Closeness to friends	4.7	36.8
Reasonable travel time between home and work	20.6	8.5
Type of neighborhood in which job is located	8.9	29.3
Orientation program	18.3	14.3
Inservice education	20.7	9.4
Work environment	37.9	2.5
Salary and fringe benefits	23.0	4.1
Ability to continue higher education while working	21.3	18.1

[1] Combines "not at all important" and "does not apply."

being comparatively young and more likely to be single than nurses on the whole, are likely to live in apartments and could conceivably move, say within a city, without being too inconvenienced.

To ascertain the types of nurses that are most interested in specific job attributes, it is useful to confine the empirical analysis to nurses with single *and* intense preferences for particular attributes. Because of personality differences and/or differences in the ways people use language, one would expect that some nurses would say that everything is "very important"; while others might exaggerate in the other direction, deemphasizing some factors that are in fact important to them. Selecting nurses with one intense preference at least eliminates the first kind of respondent.

In the empirical analysis presented in the remainder of this section, the sample is limited to registered nurses employed on a full-time basis at the time of the survey who responded that *one* (and only one) of the five items was "very important." The nine items contained in table 12 have been reduced to five by combining "closeness to family" and "closeness to friends" into one item, combining "orientation program" and "inservice education" into a single item, and eliminating "reasonable travel time between home and work" and "type of neighborhood in which the job is located." As noted, there are conceptual difficulties associated with the travel time item; and, as seen in table 12, only a few nurses stressed neighborhood considerations. The lack of impor-

tance of neighborhood is interesting in its own right, given evidence in other chapters that locational amenities are relatively unimportant to professional nurses.

Nash (1975) presented tables that clearly indicate that nurses located in geographic areas in which there were relatively fewer job openings did in fact make compromises on their initial demands. The compromise, "accept a position which made it necessary to move," was one of the least prevalent of the compromises listed. Baccalaureates differed in this regard, being far more willing to move than were the other two types of nurses. "Accept a position in a type of neighborhood you did *not* like" was an even less popular compromise. There is an inconsistency between job attributes and compromises on this point. Relatively few newly licensed professional nurses emphasized the neighborhood's attractiveness; but, in the final analysis, comparatively few nurses were willing to make actual compromises in this direction. As seen in table 13, "closeness to family and friends" rises to second place using just the five items. Least prevalent are intense responses regarding "orientation program and inservice education" and "ability to continue higher education while working."

Specification

The five mutually exclusive responses of professional nurses form the dependent variable in logit analysis of the demand for specific job attributes. Appendix D contains a brief description of multiple logit analysis for those readers unfamiliar with this technique. An equation is developed to predict the probabilities of giving any one of the five possible responses, conditional on a set of nurse characteristics that form the explanatory variables. The explanatory variables are categorized in the following ways: type of nurse training program; demographic characteristics of the nurse and her household; family income; size of nurse's com-

Table 13.—Percentage of professional nurses regarding specific job attributes as being "very important": Nurses with one single, intense preference [1]

Job attribute	Percentage "very important"
Closeness to family and friends [2]	30.2
Orientation program and inservice education [2]	10.0
Work environment	36.8
Salary and fringe benefits	13.5
Ability to continue higher education while working	9.4

[1] Based on 1,241 NLN survey responses. Responses are mutually exclusive. Only nurses with one intense preference are included.

[2] Items from table 12 have been combined, as described in the text.

munity prior to nursing school; and nursing school class standing.

Since there are three types of basic professional nurse training programs, baccalaureate, associate degree, and diploma, dummy variables for the latter two are included in the regression equation. Using the same NLN data base, Nash (1975) provided frequency distributions on the relative importance to newly licensed RNs of the job attributes listed in table 12 by type of respondent's nurse training. Nash's table suggests that newly graduated associate degree recipients are much more likely to stress "closeness to family" than are nurses as a whole. This is by far the largest difference when the importance of job attributes are sorted by nurse training. The question Nash's two-way cross-tabulation cannot answer is whether type of program has an independent effect or whether it merely represents some other factor, e.g., demographic characteristics of the nurse and her family.

The most obvious demographic factors are nurse age, marital status, and the presence of children. Younger persons are more likely to desire additional training, while the mobility literature suggests older nurses are more likely to value "closeness to family and friends."

Unfortunately, the NLN survey only obtained information on the number of children under age 6. As discussed in chapter 8, the number and age distribution of children are key explanatory variables in models of labor force participation and hours of work. In this instance, however, the analysis is restricted to nurses employed on a full-time basis. It is plausible to expect that nurses with children, especially young children, have shorter expected stays in their current job and in the labor force. For this reason, nurses with children may tend to stress *current* income and working conditions rather than continued higher education, which offers the prospect of deferred benefits.

The NLN survey does not provide a direct measure of family income from non-nursing sources. However, occupation of spouse is available. Dummy variables for spouses who are (1) clerical or sales workers, (2) craftsmen, foremen, or operatives, (3) service or farm workers, and (4) students are included as explanatory variables. The excluded spouse occupational category (which falls into the regression's intercepts) is the professional, managerial, proprietor category. It is anticipated that nurses married to professional-managerial spouses—the category of spouses that tends to have the highest earnings—are the least likely, other factors being equal, to stress salary and fringe benefits, and are relatively more likely to emphasize a pleasant and stimulating

work environment. Family income from nonnursing sources is likely to be lowest when the spouse is a student; thus, nurses married to students are hypothesized to emphasize financial aspects of their jobs.

It is anticipated that nurses who lived in small communities prior to nursing school tend to stress "closeness to family and friends." Dummy variables distinguish nurses from communities under 50,000 population, 50,000 to 750,000 population, and major metropolitan center over 750,000 population.

The NLN survey sought to obtain data on the nurse's class standing during the last year of nursing school by quartile. Understandably, the nurses' evaluations of themselves somewhat overstate their actual class rank: 46.5 percent claimed to be in the top quartile; 41.2 percent stated they were in the upper middle quarter; and only 12.2 percent stated they fell in the lower half. It is expected that the better students tend, on the average, to emphasize aspects of their job positions related to educational opportunities.

Empirical Results

Estimated parameters from the multiple logit analysis are presented in table 14. Predicted probabilities, calculated according to the method described in appendix D are found in table 15. Table 14 shows whether specific explanatory variables have statistically significant impacts; table 15 reveals the magnitude of effects of selected explanatory variables on the predicted probabilities.

When sets of mutually exclusive binary variables are used in any form of regression analysis to describe an individual, one variable from each set must be excluded. The binary variables, taken in combination, are captured by the regression's constant term. In the current application, binary variables representing baccalaureate nurses, nurses married to professional-managerial-proprietor spouses (an occupational category), nurses living in communities with populations in excess of 750,000 population, and nurses graduating in the lower half of their nursing school class fall into the constant term(s).

Each column in table 14 corresponds to equation (D.2) in appendix D. The fact, for example, that the first nurse age parameter estimate is positive means $\log_e(P_1/P_5)$ becomes larger as nurse age increases. Likewise, the positive nurse age parameter estimates in the $\log_e (P_2/P_5)$ and $\log_e (P_4/P_5)$ imply that, as nurse age rises, the probabilities of having intense preferences for orientation programs and inservice education and salary and fringe benefits rise relative to the probability of having an intense

Table 14.—Aspects of employment most important to professional nurses: Logit analysis

Explanatory variables	$\log_e(P_1/P_5)$	$\log_e(P_2/P_5)$	$\log_e(P_3/P_5)$	$\log_e(P_4/P_5)$	χ^2 (4 d.f.)
Constants	−0.943E 00	−0.147E 00	0.194E 01	−0.254E 00	-
Nurse has diploma	−0.769E−01	−0.738E−01	0.395E 00	0.684E−01	9.41
Nurse has associate degree	−0.307E 00	−0.321E−01	−0.288E 00	−0.508E−00	4.37
Nurse's age	0.572E−01	0.157E−01	−0.178E−01	0.176E−01	[1] 41.32
Nurse not married	0.511E−08	0.279E−09	−0.467E−10	−0.109E−09	0.05
Number of children under 6	0.228E 00	−0.376E 00	−0.204E−02	0.172E 00	5.40
Spouse is clerical or sales worker	0.160E 01	0.100E 01	0.104E 01	0.140E 01	6.97
Spouse is craftsman, foreman, or operative	0.117E 01	0.746E 00	0.556E 00	0.490E 00	[1] 15.11
Spouse is service or farm worker	0.102E 01	0.834E 00	−0.206E 00	0.396E 00	[2] 10.17
Spouse is student	0.520E 00	−0.282E−01	0.310E 00	0.624E 00	5.77
Town before nursing school under 50,000 population	0.572E 00	0.245E 00	−0.946E−01	0.101E 00	[2] 12.01
Town before nursing school 50,000 to 750,000 population	0.140E 00	−0.483E 00	−0.270E 00	−0.569E 00	7.02
Nurse in top quarter of class	0.972E−01	−0.421E 00	−0.326E 00	0.153E 00	6.01
Nurse in upper middle quarter of class	−0.816E−01	−0.352E 00	−0.201E 00	0.114E 00	2.08
	R^2=0.13				
	χ^2(52 d.f.) = [1] 166.38				

[1] Means significant at the 1-percent level.
[2] Means significant at the 5-percent level.

Key:
Group 1—Closeness to family and friends.
Group 2—Orientation program and inservice education.
Group 3—Work environment.
Group 4—Salary and fringe benefits.
Group 5—Ability to continue higher education while working.

Note: Each column corresponds to equation (D.2) in Appendix D.
$\bar{P}_1$=0.30; $\bar{P}_2$=0.10; $\bar{P}_3$=0.37; $\bar{P}_4$=0.14; $\bar{P}_5$=0.09
Bar over the probability means the probability for the sample.

Table 15.—Impacts of selected explanatory variables on attribute demand

Variant	Nurse has diploma	Nurse has associate degree	Nurse's age	Number of children under age 6	Spouse is clerical or sales worker	Spouse is student	$\hat{P}_1$	$\hat{P}_2$	$\hat{P}_3$	$\hat{P}_4$	$\hat{P}_5$[1]
1.	[2] 0.0	0.0	22.0	[3] 0.0	0.0	0.0	0.26	0.08	0.39	0.12	0.15
2.	0.0	0.0	22.0	1.0	0.0	0.0	0.31	0.05	0.37	0.13	0.14
3.	0.0	0.0	22.0	0.0	0.0	1.0	0.31	0.05	0.38	0.15	0.11
4.	1.0	0.0	22.0	0.0	0.0	0.0	0.21	0.06	0.50	0.11	0.13
5.	1.0	0.0	22.0	0.0	1.0	0.0	0.33	0.05	0.45	0.14	0.04
6.	0.0	1.0	22.0	0.0	1.0	0.0	0.40	0.08	0.34	0.12	0.06
7.	0.0	1.0	22.0	0.0	0.0	0.0	0.25	0.09	0.38	0.09	0.19
8.	0.0	0.0	27.0	0.0	0.0	0.0	0.33	0.08	0.34	0.12	0.14
9.	1.0	0.0	27.0	0.0	0.0	0.0	0.27	0.06	0.43	0.11	0.12
10.	0.0	1.0	27.0	0.0	0.0	0.0	0.31	0.10	0.32	0.09	0.18
11.	0.0	0.0	32.0	0.0	0.0	0.0	0.40	0.08	0.28	0.12	0.13
12.	1.0	0.0	32.0	0.0	0.0	0.0	0.33	0.06	0.37	0.11	0.12
13.	0.0	1.0	32.0	0.0	0.0	0.0	0.38	0.09	0.27	0.09	0.17

[1] Predicted probabilities may not sum to 1 because of rounding error.
[2] A zero value signifies that the nurse does not have the attribute in question (e.g., a diploma). The value 1 signifies the nurse does have the attribute in question.
[3] This is not defined as a binary variable, but rather is continuous.

preference for opportunities to continue higher education (in nursing) while working. The negative age parameter estimate in the $\log_e (P_3/P_5)$ column, viewed in conjunction with the positive estimates in the other columns, implies that the probability of intense preferences for a pleasant work environment falls in comparison to the other job attribute groups as the nurse becomes older. One also learns from table 14 that nurse age is far superior to the other explanatory variables in terms of statistical significance.

The impacts of nurse age and other explanatory variables are assessed in table 15. Variants 1 through 7 assume the nurse is age 22. In variants 8 through 10 and variants 11 through 13, nurse age is considered to be 27 and 32, respectively. Variants 1 and 11 both assume the nurse (1) has a baccalaureate; (2) has no children under age 6; (3) is married to a professional-manager-proprietor; and (4) (as in all 13 variants) came from a community of over 750,000 population prior to nursing school; and (5) graduated in the upper middle quarter of her nursing school class. The variant 1 and 11 nurses, however, differ in age—22 versus 32.

Comparing the predicted probabilities, the probability that closeness to family and friends will be emphasized rises from 0.26 in variant 1 to 0.40 in variants 6 and 11. The most pronounced decline is the probability of emphasizing working environment. With the exception of nurse age, variant 4 compares to variants 9 and 12, and variant 7 compares to variants 10 and 13. Substantial changes in the probabilities, attributable to nurse age, are evident in these variants as well.

With a chi-square of 9.41, the nurse diploma variable nearly has a statistically significant impact on the probabilities at the 5-percent level. Given a chi-square of 4.37, the associate degree parameter estimates merit less confidence. With nurse age and other variables included, the propensity of associate degree nurses to favor proximity to family, as suggested by Nash's (1975) cross-tabulations between nurse preferences for specific job attributes and nurse training program, vanishes. Table 15 variants 1 through 3, 8, and 11 identify baccalaureate nurses. Variants 4, 5, 9, and 12 identify diplomates; the remaining variants identify associate degree recipients. Contrasting variant 4 probabilities with, say, variant 1 probabilities (which are comparable in every other respect), it is evident that baccalaureates (with intense preferences for one of the five attributes) are more likely to stress family-friends proximity and less likely to stress work environment. Baccalaureates are identified in table 15 by the presence of zeros in the associates *and* diploma columns. The major differ-

ence between variant 1 and 7 (which rather than a BA refers to an associate degree recipient) probabilities is the latter's emphasis on continuing education opportunities. On the whole, however, the (independent) impacts of having an associate degree are small; although the relative importance of the continuing education attribute to associate degree nurses is also evident in one of Nash's tables (p. 43).

Marital status per se makes essentially no difference in nurse preferences for the alternatives considered in table 14. The number of children under age 6 makes some difference (although the associated parameter estimates are not significant at conventional levels). Variants 1 and 2 in table 15 are identical; except in the latter case the nurse is assumed to have no children under age 6. The presence of a child raises the probability of stressing proximity to family and friends with some corresponding decline in emphasis on the second, third, and fifth job attribute categories.

As expected, nurses married to professional-managerial-proprietors tend to emphasize salary and fringe benefits less. Also stressed less is proximity to friends-family. Since professionals tend to be more mobile as a group, this result may reflect past migrations of this group. Variants 4 and 5 in table 15 are identical, except in variant 5 the nurse is married to a clerical or sales worker rather than a professional-manager-proprietor. The variant 5 nurse places much more weight on closeness to family and friends and somewhat more weight on salary and fringe benefits; there is correspondingly much less value placed on ability to continue higher education while working. Comparing variants 1 and 3, it is also evident that a higher proportion of nurses married to students emphasize pecuniary factors.

The quartile rankings have an insignificant impact. The signs of the coefficients associated with these variables are often the opposite of the anticipated ones. Given the tendency of the nurse respondents to overstate their class ranks, the overall poor performance of these variables is not too surprising.

Variations in the Extent of Job Search

In this section, variations in the extent to which newly graduated nurses search for their first positions after graduation are investigated. The extent of job search is measured along two dimensions: (1) the number of positions the nurse actively pursued in obtaining her first position; and (2) the number of weeks she devoted to job search. These are the dependent variables. Questions for which the empirical analysis is pertinent are: Do nurses with intense job demands search more in general; and do

nurses with specific demands search more in particular? Nurses with "better" credentials may search less, because they are sought after by the most "attractive" potential employers in the area, while the others end up "pounding the pavement," at least in relative terms. The reason for this pattern, if it is indeed observed, may be employers are willing to provide the "best" job candidates with detailed descriptions of hospital offerings as a means of recruiting. In a sense, this type of advertising, in itself a form of compensation, may be seen as a substitute for other types of financial and nonfinancial benefits. Nurses without the benefit of such employer-provided information may have to spend more time in the market to obtain an equivalent amount of information. It is, of course, possible that nurses with "better" credentials may search more—as the dependent variables used here are defined—because job information is only provided if the nurse applies for a position. Accordingly, the employer may be more likely to provide subsidies, such as trips, for applicants deemed most qualified.

The general notion is akin to the concept of the "dual" labor market in which some persons, deemed most "attractive" because of race or sex or some other characteristic are able to secure "good" jobs; the other jobs, i.e., the "bad" jobs, go to the less attractive. Much more than wages is involved in the difference between "good" and "bad."

Specification

Explanatory variables fall into four categories: dummy variables indicating intense preferences for specific job attributes; class standing; type of nursing program attended; and a dummy variable indicating whether or not the nurse attended an NLN accredited nursing school.

The job attribute variables are defined in two ways. The "DET" variables are constructed in the same way as in the logit analysis, except orientation and inservice education are specified as separate explanatory variables. The "DETER" variables are developed from responses that an attribute is "very important"; but the second specification permits a nurse to answer "very important" to more than one attribute. By contrast with the DET variable specification, a nurse naming more than one attribute would not be included in DET1 through 6, but would rather be included in the intercept. Newly licensed nurses who said they knew where they were going to work and therefore did not actively pursue other jobs have been excluded from the job search regressions.

Empirical Results

Concise definitions of the determinants of extent of search for first position are presented in table 16. The job search regressions follow in table 17. Although the R^2s are uniformly low, there are several interesting aspects to these results.

First, nurses who place a substantial emphasis on "closeness to family and friends" spend less time on job search. As seen in table 17, nurse age is an important predictor of the extent to which this attribute is emphasized.

Second, judging from the parameter estimates of DETER2 through DETER6 and DET 2 through DET6, nurses with intense preferences for particular job attributes do not devote more time and effort to search than their colleagues who place less importance on the specific attributes listed in the NLN survey. However, there are differences in the amount of search, depending on the attribute stressed. Nurses who are very interested in work environment or opportunity to continue higher education in nursing while working, actively pursue more positions, although in the latter case the time period over which job search is conducted tends to be shorter. By contrast, nurses emphasizing salary search less, gauged in terms of number of positions pursued and weeks devoted to job search. A plausible explanation of this pattern is that salary and fringe benefits information is

Table 16.—Concise definitions of determinants of extent of search for first position

Explanatory variable	Definition
AA	Nurse has associate degree
ACCREDIT	Nurse graduated from NLN-accredited school
DET1	[1] Intense preference for family-friends
DET2	[1] Intense preference for orientation program
DET3	[1] Intense preference for inservice education
DET4	[1] Intense preference for work environment
DET5	[1] Intense preference for continuing education
DET6	[1] Intense preference for salary-fringe benefits
DETER1	[2] Intense preference for family-friends
DETER2	[2] Intense preference for orientation program
DETER3	[2] Intense preference for inservice education
DETER4	[2] Intense preference for work environment
DETER5	[2] Intense preference for continuing education
DETER6	[2] Intense preference for salary-fringe benefits
DIP	[1] Nurse has a diploma
UPQTR	[1] Nurse in top quarter of class
UPMQTR	[1] Nurse in upper middle quarter of class

[1] Intense preferences defined to be mutually exclusive.
[2] Intense preferences defined to be not mutually exclusive.

Table 17.—Job search regressions

Explanatory variables	Number of positions actively pursued		Weeks devoted to search	
	Variant I	*Variant II*	*Variant I*	*Variant II*
DETER1	[1] −0.330	–	[1] −0.595	–
	(0.085)	(–)	(0.219)	(–)
DETER2	0.071	–	0.172	–
	(0.111)	(–)	(0.285)	(–)
DETER3	−0.176	–	0.048	–
	(0.111)	(–)	(0.288)	(–)
DETER4	0.141	–	0.111	–
	(0.077)	(–)	(0.198)	(–)
DETER5	[2] 0.222	–	−0.368	–
	(0.096)	(–)	(0.246)	(–)
DETER6	−0.139	–	−0.341	–
	(0.090)	(–)	(0.233)	(–)
DET1	–	−0.223	–	−0.017
	(–)	(0.126)	(–)	(0.325)
DET2	–	0.153	–	0.752
	(–)	(0.240)	(–)	(0.617)
DET3	–	−0.369	–	−0.999
	(–)	(0.307)	(–)	(0.789)
DET4	–	[1] 0.281	–	0.094
	(–)	(0.106)	(–)	(0.272)
DET5	–	0.150	–	−0.459
	(–)	(0.205)	(–)	(0.527)
DET6	–	0.068	–	0.441
	(–)	(0.182)	(–)	(0.470)
UPQTR	−0.047	−0.062	0.107	0.042
	(0.105)	(0.106)	(0.270)	(0.272)
UPMQTR	−0.121	−0.142	0.229	0.173
	(0.105)	(0.106)	(0.272)	(0.272)
DIP	[1] −0.427	[1] −0.435	[2] 0.421	[1] 0.411
	(0.083)	(0.083)	(0.213)	(0.213)
AA	[1] −0.320	[1] −0.343	[1] −0.888	−0.977
	(0.100)	(0.100)	(0.258)	(0.256)
ACCREDIT	0.018	0.037	0.083	0.073
	(0.090)	(0.090)	(0.231)	(0.232)
CONSTANT	3.33	3.30	4.59	4.48
	(–)	(–)	(–)	(–)
	R^2=0.03	R^2=0.02	R^2=0.03	R^2=0.03
	F(11,1906)	F(11,1906)	F(11,1906)	F(11,1906)
	=[1] 5.49	=[1] 5.20	=[1] 5.42	=[1] 4.66

[1] Significant at the 1-percent level.
[2] Significant at the 5-percent level.

better disseminated than is information on a more subjective aspect such as work environment.

Third, there are significant differences in job search activity by type of program, but not by class standing or the school's NLN-

accreditation status. Baccalaureate nurses pursue more positions; the relative standing on weeks devoted to search is somewhat ambiguous, however, as the diploma coefficient is sensitive to the criteria used to screen the data. Given the poor performance of the class-standing and accreditation variables, attributing the differences among nurse training programs to differences in credentials is probably not justified. The fact that baccalaureates search more is consistent with their greater mobility, which has been measured in several ways. These results certainly do not suggest, in any case, that nurses with "better" credentials are "snapped up," leaving the job market to those who are "less attractive" candidates. Future surveys should measure the credentials' variables more precisely.

Effects of Job Search

Job search may be viewed in both an active and a passive sense. Taking the first meaning, nurses face roughly equivalent job opportunites, but some nurses for one reason or another are willing and able to devote more effort to obtaining a good job. The return to these nurses is higher financial and nonfinancial compensation than they would otherwise receive. From the passive view, nurses face very different job opportunities; the less fortunate must search more, constantly lowering their job expectations in the process. In the first instance, the effect of search on financial and nonfinancial aspects of the job ultimately obtained is positive, while in the latter it is negative. Of course, as we have just seen, nurses with particular demands will search more; and for this reason, it is essential to control for the intensity and type of job demand.

Table 18 contains regressions with the nurses' first-position annual salary, measured in thousands of dollars, as the dependent variable. As in all the regressions in this chapter, only nurses employed full time are included. However, in contrast to the job search regressions in table 17, newly licensed nurses who did not know where they were going to work and thus did not actively pursue a job are included in table 18's regressions.

The coefficient of the number of positions actively sought (JOBSEEK) consistently has a negative sign, but is never statistically significant at conventional levels. Possibly forces causing a positive sign, as well as those causing a negative sign, are at work, and the two offset one another.

It would be plausible to expect that nurses with intense demands for nonfinancial job attributes would have to give up some financial compensation in return. Closeness to family and friends is the only nonfinancial attribute consistently emphasized and

Table 18.—First-position annual salary regressions

Explanatory variables	Variant I	Variant II	Variant III
JOBSEEK	−0.010	−0.013	−0.010
	(0.013)	(0.013)	(0.013)
DETER1	–	[1] −0.124	–
	(–)	(0.046)	(–)
DETER2	0.081	0.082	–
	(0.062)	(0.062)	(–)
DETER3	0.022	0.028	–
	(0.062)	(0.062)	(–)
DETER4	0.030	0.030	–
	(0.042)	(0.042)	(–)
DETER5	0.035	0.039	–
	(0.052)	(0.052)	(–)
DET1	–	–	−0.208
	(–)	(–)	(0.067)
DET2	–	–	0.042
	(–)	(–)	(0.164)
DET3	–	–	0.092
	(–)	(–)	(0.164)
DET4	–	–	−0.051
	(–)	(–)	(0.059)
DET5	–	–	−0.204
	(–)	(–)	(0.112)
UPQTR	0.052	0.060	0.059
	(0.058)	(0.058)	(0.058)
UPMQTR	0.009	0.013	0.010
	(0.058)	(0.058)	(0.058)
DIP	[1] −0.480	[1] −0.480	[1] −0.480
	(0.048)	(0.048)	(0.048)
AA	[1] −0.319	[1] −0.305	[1] −0.303
	(0.056)	(0.056)	(0.055)
ACCREDIT	−0.005	−0.008	−0.006
	(0.049)	(0.049)	(0.049)
NE	[1] −0.385	[1] −0.390	[1] −0.379
	(0.088)	(0.088)	(0.088)
MA	−0.122	−0.125	−0.124
	(0.073)	(0.073)	(0.073)
ENC	[1] (0.459)	[1] −0.458	[1] −0.459
	(0.072)	(0.072)	(0.072)
WNC	[1] −1.007	[1] −1.005	[1] −1.011
	(0.084)	(0.083)	(0.083)
SA	[1] −0.867	[1] −0.866	[1] −0.870
	(0.077)	(0.077)	(0.077)
ESC	[1] −0.798	[1] −0.803	[1] −0.787
	(0.106)	(0.106)	(0.106)
WSC	[1] −1.050	[1] −1.045	[1] −1.047
	(0.096)	(0.096)	(0.096)
M	[1] −1.202	[1] −1.206	[1] −1.210
	(0.111)	(0.110)	(0.110)
TOWN1	[1] −1.394	[1] −1.373	[1] −1.376
	(0.135)	(0.135)	(0.135)

Table 18.—First-position annual salary regressions—Continued

Explanatory variables	Variant I	Variant II	Variant III
TOWN2	[1] −1.181	[1] −1.162	[1] −1.173
	(0.070)	(0.070)	(0.070)
TOWN3	−1.010	[1] −0.995	[1] −1.004
	(0.054)	(0.054)	(0.054)
TOWN4	[1] −0.720	[1] −0.714	[1] −0.713
	(0.051)	(0.051)	(0.051)
TOWN5	[1] −0.405	[1] −0.402	1 −0.405
	(0.072)	(0.072)	(0.072)
CONSTANT	9.887	9.904	9.939
	(–)	(–)	(–)
	R^2=0.26	R^2=0.26	R^2=0.26
	F(23,3163)= [1] 47.69	F(24,3162)= [1] 45.87	F(24,3162)= [1] 45.83

[1] Significant at the 1-percent level.

Key

For definitions of DETER1 through DETER6, DET1 through DET6, UPQTR, UPMQTR, DIP, AA, and ACCREDIT, see table 17.

NE	Nurse works in New England Census Division
MA	Nurse works in Mid-Atlantic Census Division
ENC	Nurse works in East North Central Census Division
WNC	Nurse works in West North Central Census Division
SA	Nurse works in South Atlantic Census Division
ESC	Nurse works in East South Central Census Divisvn
WSC	Nurse works in West South Central Census Division
M	Nurse works in Mountain Census Divisi.n
P	Nurse works in Pacific Census Division (excluded category)
TOWN1	Nurse works in under 2,500 population community
TOWN2	Nurse works in 25,000—10,000 population community
TOWN3	Nurse works in 10,000—50,000 population community
TOWN4	Nurse works in 50,000—750,000 population community
TOWN5	Nurse works in 750,000—1,000,000 population community
TOWN6	Nurse works in 1,000,000+ population community (excluded category)

nurses stressing this attribute tend to search less. For this reason, the variable DETER1 was eliminated from one variant with the expectation that JOBSEEK's coefficient would become more positive. Eliminating DETER1, however, has essentially no effect on JOBSEEK's parameter estimate. It is certainly possible that nurses with intense preferences for proximity to family and friends are less aggressive in job hunting; but, if so, the JOBSEEK measure is insufficiently precise to capture this influence.

The class standing variables' parameter estimates have the anticipated positive signs, but the estimates never attain statistical significance. Accreditation is accurately measured, but it has no impact on earnings of the recently graduated nurse. As anticipated, newly licensed baccalaureates earn significantly more, and judging from the TOWN coefficients, starting salaries increase monotonically with the size of the community in which the nurse works.

Conclusions and Implications

This chapter has been concerned with (1) the degree to which newly graduated nurses are mobile geographically, (2) several aspects of the process according to which prospective nurse employers are matched, and (3) the types of job attributes newly graduated nurses currently stress when looking for work.

Geographic mobility has an important bearing on the kinds of policies one should implement to improve the spatial distribution of nurses. If nurses are immobile, programs should be implemented to attract young people into nursing in areas judged to be underserved and/or incentives should be designed to increase nurse labor force participation from the existing pool. On the other hand, if nurses are mobile, there is at least a chance that employers can attract nurses from other areas if the right mix of incentives is offered.

The process according to which nurses are matched with employers also potentially offers important lessons for policy. If nurses do not attempt to learn about alternative job offerings, it is not likely they will respond to concrete incentives, at least in making choices among employers initially. It is possible, of course, that attractive offerings may affect retention. But this is a matter considered in chapter 6. An element of the process involves the compromises nurses make when they are not successful in finding the job of their first choice. First, how many nurses now have to make compromises? Then, how far down the list of compromises is changing locations? If moving is far down the list, it would probably take a depression in the nurses' market to force large-scale moving for purposes of securing employment. A depression might indeed be accomplished by overproducing nursing school graduates, but such a policy is questionable on grounds of efficiency, and it would undoubtedly be resisted by nurses already in practice.

Finally, by determining the types of job attributes emphasized by newly graduated nurses, one may recommend the kinds of incentives that might be effective in improving nurse availability in underserved areas. We have also been interested in preference differences according to the type of nurse training program attended. In what respects do baccalaureates differ? There are other methods for obtaining this kind of information; chapters 6 and 7 utilize two of these.

As documented by Sloan (1975), young nurses are especially mobile, but not as mobile immediately upon graduation as they are a *few* years hence. Thus, while the newly licensed nurses surveyed by the National League for Nursing are mobile, still greater degrees of mobility could have been observed if the re-

spondents had been professional nurses surveyed 3 or 5 years after graduation from nursing school. However a greater degree of mobility is undoubtedly displayed by this sample of newly licensed nurses than would be found in a sample of nurses predominantly in the 30-and-over age group.

The "average" nurse looks for her first job as a professional nurse over a fairly circumscribed geographic area. Although she may pursue several positions, job search is conducted over a reasonably short time period—fewer than 4 weeks—and most often, over a very circumscribed area. For the "modal" nurse, there is no comprehensive evaluation among a large number of job alternatives. On the whole, the market for newly graduated (licensed) staff nurses is by no means national; the market for nurses in administrative and faculty positions undoubtedly has a larger scope, but our study provides no new evidence of this. Our finding does not at all rule large numbers of moves for personal (as opposed to professional) reasons. A substantial proportion of moves has this primary motivation.

As of 1973, the year of the NLN survey, unemployment among newly licensed nurses was virtually unknown. Job search on the part of these nurses is fundamentally different from job search among the Nation's unemployed as a whole, the group addressed by the job search literature economics. In the case of the nurses analyzed here, most search is conducted while the nurse is still in professional school. This suggests that efforts to recruit young nurses for work in underserved areas should be concentrated in the professional schools themselves during the brief period in which the decision about the first job is being made. Direct appeals at this time are likely to be more successful than advertisements in regional or national newspapers and professional journals.

The NLN survey ascertained that, although newly licensed nurse unemployment was low, there were systematic differences by geographic area in the availability of professional nursing positions. Some nurses, facing some difficulty in securing employment, had to make one or more compromises. While they made some compromises to secure employment, moving to another area appears to have been one of the least frequently exercised options in relative or in absolute terms. At least at the level of the staff nurse, there are a number of prospective employers from which to choose, and, among these, the terms under which employment is accepted can be varied. So very few nurses looking for staff jobs feel they "have" to move. If market conditions deteriorated, this situation of course could change.

To better understand the job search process, we specified and

estimated job search regressions. The regressions that one thought would explain the variations in job search of different types of nurses, in fact, explain very little of the variation. Nurses especially interested in salary and fringe benefits do not search more than their colleagues. We judge that salary information is fairly easy to obtain without a formal job interview. This result could also mean that nurses who emphasize salary and fringe benefits are not really all that serious about it. By contrast, in most of the regressions, nurses who stress a good working environment do indeed search more, probably because information on this attribute is not as easily obtained as is salary information. To the extent that they have desirable offerings, hospitals may do well to better publicize aspects of their work environment. But in view of other findings, we suggest that a direct approach to nursing students will probably be more successful than advertising nationally in professional and trade journals. This recommendation receives additional support from the finding that "work environment" is much more likely to be emphasized by newly licensed nurses, with "salary and fringe benefits" a distant second. Finally, it is not clear that nurses with "better" credentials are "snapped up" and, as a result, exhibit less extensive job search. Baccalaureates, in fact, actively pursue more positions, a finding consistent with their higher degree of mobility. Class standing and nursing school NLN-accreditation status have no independent effect on job search.

There is substantial variation in the job attributes stressed by newly licensed professional nurses. To a certain extent, this variation can be linked to the explanatory variables considered in the empirical analysis. As one would expect, older newly licensed nurses and those with young children tend to emphasize the importance of proximity to family and friends; and this preference, in turn, is reflected in their lower mobility. As anticipated, nurses married to spouses employed in higher income occupations are less likely to stress salary and fringe benefits.

With a number of explanatory variables included, job attribute preferences do not differ in a statistically significant way on the basis of the type of training program attended by the nurse; differences seen in two-way tabulations by type of nursing degree are mainly due to differences in socioeconomic characteristics of nurses. Although the type of nurse training program per se does not have a significant impact on nurses' job preferences, at least immediately upon graduation, this finding should not be construed to mean policymakers should be indifferent as to which of the three types of nurse training programs is expanded. There are systematic relationships among the kinds of nurses entering

particular program types and socioeconomic background characteristics of the nurse do make a difference in our empirical analysis. Moreover, it is possible that nurses' preferences are important over the longer term. For example, over a period of years, information obtained in baccalaureate nursing programs may encourage nurses to develop in leadership roles. The NLN survey data yield no evidence on this point.

Finally, regression analysis was employed to ascertain the marginal financial returns to the nurse from extended job search. None is, in fact, evident. However, it is apparent that nurses emphasizing proximity to family and friends do pay for this convenience in terms of a lower starting salary; and somewhat surprisingly, emphasis on a pleasant work environment, although encouraging job search, has no discernible impact on nurses' starting salaries.

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Chapter 6
NURSE RETENTION IN CURRENT EMPLOYMENT

Frank A. Sloan

Introduction

Nurse turnover has both positive and negative aspects, depending on one's vantage point. For the nurse's current employer, the loss of an employee raises his recruitment and training outlays. For another employer, however, voluntary quits are a potential source of nursing services for him. Certainly, if nurses currently employed in "advantaged" areas rarely quit, employers in geographic areas considered "underserved" have lost a potential source of labor. Moreover, high quit rates in underserved areas make the task of achieving an adequate supply of nurses much more difficult.

Historically, nurse turnover has been high, both in absolute terms and relative to other predominantly female, professional occupations such as teaching and social work.[1] Assuming that employers of nurses allocate their resources so as to equate the marginal cost of replacing a nurse to the marginal cost of incentives needed to retain her, the high rate of voluntary quits reflects (1) a low marginal cost of replacement and/or (2) a low responsiveness of quits to incentives (equivalently, a high marginal cost of retention).

The oft-cited contention that professional nurses quit for "personal" reasons rather than dissatisfaction with their current employers suggests the other factors may be very important in nursing.[2] For example, if a nurse quits because she is expecting a child and wishes to be at home during the child's first 2 years, the incentives needed to induce her to leave for only a brief time period may be tremendous, particularly if the incentives can't be offered selectively; that is, only to nurses on the verge of leaving. Another example would be a nurse's resignation because her spouse has been transferred or taken a job in a location from which she cannot commute to her current place of employment.

Differences between nursing and other professional occupations may largely be explained by the longer work year in nursing (as opposed to teaching), the irregular hours, and the need for

[1] See references in Archibald (1971) and Elnicki (1975).
[2] See Archibald (1971) and Elnicki (1975).

nurse staffing during evenings and nights, times clearly not compatible for the nurse who is also a wife and mother. There may also be, as Archibald (1971) notes, preference differences among the professions. Since nurses spend a great deal of time in close one-to-one contact with patients, they may as a group be especially desirous on having a similar closeness to their families.

To the extent personal factors are important, researchers and policy analysts may be doing a disservice by recommending that employers of nurses take measures to lower their quit rates, because high quit rates may in fact be optimal. Research to date, however, has been insufficiently conclusive to rule out the possibility of incentives that would be cost-effective in reducing nurse turnover.

The purpose of this chapter is to assess the relative importance of (1) characteristics of the professional nurse, (2) characteristics of the nurse in relation to her present job, and (3) characteristics of the nurse's employer as determinants of nurse retention in current employment. Personal characteristics of the nurse include, but are not limited to, age, race, children, and so on; characteristics in relation to the current employer encompass job tenure, the salary earned by the nurse in relation to what a nurse with her credentials would typically earn elsewhere; characteristics of the nurse's employer include, for example, hospital affiliations, provision of day care, inservice education, life insurance, and proxies for working conditions.

At issue is whether providing specific incentives, as represented by the same of the second and the third kinds of variables, affect nurse retention in current employment. Or do the personal factors, represented by the first type of variables dominate? If they do, turnover is to a large degree beyond the hospital's control, unless it discriminates in hiring on the basis of personal characteristics associated with longevity on the job.

Archibald (1971) and Elnicki (1975) provide comprehensive reviews of the nurse turnover literature; there is therefore no need to repeat their summaries here. However, a brief review of the results of Elnicki's work on nurse quit rates, using the University of Florida's Survey of Hospital Directors of Nursing, and Sloan's (1975) empirical analysis of nurse retention in current employment, based on the University of Florida's Survey of Registered Nurses, is useful for interpreting the new evidence presented in this chapter.

The Elnicki and Sloan Studies

Elnicki's research was concerned with specific hospital attri-

butes that explain interhospital variation in professional nurse quit rates. The list of attributes included: bed size; hospital affiliation with a medical school; hospital affiliation with a degree-granting school of nursing or with a school offering an RN diploma; RN coverage by a collective bargaining agreement; hospital ownership (voluntary versus government versus proprietary); the degree to which the area surrounding the hospital is urbanized; the proportion of a county's beds in the survey hospital; and adequacy of parking facilities and housing. Also included were: whether evening shift differentials are paid and hospital wage rates are favorable to those in the county as a whole; whether RN vacation and sick leaves are higher than the U.S. mean; whether inservice education is budgeted and the hospital offers its own refresher courses or subsidizes them; adequacy of working conditions (defined in terms of schedules; whether diploma graduates can fill supervisory positions and if the number of these filled internally is greater than the U.S. average; and whether the days' notice given for a permanent shift change is either greater than the U.S. average or not applicable); and adequacy of hospital's life and health insurance and retirement plans.

Both tests of differences between means and regression analysis failed to reveal any relationships between any of these factors and quit rates.[3] In fact, the R^2 of the regression was 0.02.

Elnicki did not explicitly include any variables to account for interhospital differences in nurse attributes, as opposed to hospital attributes. Since such variables should have been included, there is a possibility that the coefficients of the included hospital attribute variables are subject to omitted variables bias. However, a rather convincing argument can be made that, if anything, hospitals with relatively poor offerings attract nurses who are *less* prone to view the hospital as their lifelong employer. If so, exclusion of nurse attribute variables should bias parameter estimates of the included explanatory variables, and their associated t-values away from, not toward, zero (i.e., leading to an overstatement rather than an understatement of incentives' effects).

Sloan analyzed determinants of professional nurse retention in current hospital employment. The dependent variable in the retention regression was the number of years the nurse indicated, as a respondent to the University of Florida's Survey of Registered Nurses, that she intended to remain with her current employer. Categories of explanatory variables in the regression

[3] In some instances, these variables have proved to be statistically significant. For example, union coverage had a statistically significant and negative impact in turnover in two studies of interindustry differences in quit rates (Pencavel, 1970; and Stoikov and Raimon, 1968).

were: personal characteristics of the nurse; characteristics of the nurse's household; family earnings and income from sources other than nursing employment; past mobility of the nurse and number of years with current employer; full- or part-time status; working conditions; opportunities for professional advancement or promotion within the hospital; nurse wages and fringe benefits; and other characteristics of the hospital, including the location.

Although the R^2s were not high (around 0.2), they were substantially higher (by a factor of 10) than those of Elnicki's quit rate study based on the Survey of Hospital Directors of Nursing. Furthermore, the parameter estimates of several variables were statistically significant at the 5-percent level or better.

The principal findings of Sloan's research on retention were as follows: First, the nurse's expected stay rises as a function of her age until age 60; thereafter, it declines. Second, the number of the nurse's children age 2 to 6 years lengthens the expected stay. This result was tentatively explained by a process of self-selection. Nurses who choose to work when their children are young are a "select group," i.e., not necessarily representative of nurses as a whole; employed nurses with young children may be particularly career-oriented and not as prone to leave the labor force as are others. Third, spouse earnings had a positive impact on the expected stay, although this variable's coefficient was not significant at conventional levels, a similar pattern can be observed in regressions presented later in this chapter. Fourth, length of current employment had a positive impact on expected stay, possibly because of benefits gained by the nurse from seniority and vested pensions. Fifth, the performance of variables describing working conditions, professional advancement, promotion, and fringe benefit variables was generally poor. Sixth, wage rates had the anticipated positive effect on expected stay.[4] Finally, nurses employed by hospitals affiliated with medical schools reported lower expected stays. One explanation for this pattern is nurses' status may be comparatively low in a medical school setting.

The Sloan (1975) study also presented some tabulations describing characteristics of nurses who are willing to move to either another community within a State and/or to another State, and nurse attitudes about accepting employment in a rural area or a poor section of a major metropolitan area.[5] The primary conclusions were:

[4] The specification of the wage variable used in Sloan (1975) and in he new research presented in this chapter will be reviewed later.

[5] These terms are described more precisely in the next section.

Married nurses, particularly those with children, are highly immobile. It would not be fruitful to develop incentives to induce such nurses to change the location of their employment. Single nurses, who are also more likely to be young, are considerably more mobile.

There is much more nurse resistance to employment in central cities of metropolitan areas than to rural employment. For this reason, nurse supply problems in central cities merit particularly serious policy consideration. Black nurses are relatively more willing to work in central cities than are whites; on the other hand, whites are more favorably disposed to rural areas. Baccalaureates are less adverse to working in central cities than are associate degree graduates. They are more likely to leave the area in which they went to college, but may be better "targets" for incentives to induce nurses to work in underserved areas, particularly central cities. (p. 155.)

Conceptual Considerations and Equation Specification

Chapter 4 described a present value formula representing net returns to the employee choosing a specific location. The formula can be generalized to the choice of specific employers within specific locations by adding subscripts to represent different employment settings within that location. The concept can be made even more general if one of the potential "employers" within the location is considered to be the household itself. Voluntary quits in nursing frequently involve movements out of the labor force as well as movements to other employers. As indicated earlier, unemployment per se is not important in nursing.

The terms in the present value formula containing the letter N relate to the expected nonpecuniary returns from a particular job in a specific location. While the census data base permits analysis of responses to differences in location-specific attributes, it does not permit analysis of responses to differences in employer-specific attributes. Thus, it was necessary to neglect "N" factors, which encompass benefits, training programs, working conditions, and the like in chapter 4.

The Survey of Registered Nurses, when used in conjunction with the Survey of Hospital Directors of Nursing, contains a considerable amount of detail on the "N" factors, but it is deficient in other respects. In chapter 4, the present value formula could be largely approximated by (1) stratifying nurses by age,[6] and (2) developing pairwise differences between alternative status and the nurse's 1965 status. With one exception, however, the Survey of Registered Nurses permits one to include only attributes of the respondent's current employment situation; one cannot make a comparison between an alternative and the nurse's current situation. In chapter 6, the basic hypothesis is that the less desirable the nurse's current employment situation, the

[6] To reduce the number of regressions to be presented, nurse age is included as an explanatory variable in this chapter rather than stratifying nurses by age and estimating separate regressions for each group.

more likely the present value is to be positive. When the present value is positive, as shown in chapter 4, the nurse is more likely to leave her current employer, either for another employer or, more generally, to exit from the labor force.

A positive present value represents a disequilibrium state. When one finds a person in disequilibrium, it raises the question of why this state occurred. Obviously, one answer is conditions change. An employer may offer comparatively attractive benefits, but his relative position may have deteriorated. Or situations in the household may have changed. Another reason relates to the costs of job search (a topic investigated in the previous chapter), since evaluating alternative job opportunities is costly and obtaining information on particular aspects of a prospective employment situation may be difficult. Thus, it may be optimal for the individual to take a job, even if the probability is reasonably high that the job will not turn out to be ideal, in retrospect. To the extent this motive is important in nursing, one would expect voluntary quit rates to be high. According to the Survey of Registered Nurses, nurses take a new job about once every 3 years (this calculation includes time spent out of the labor force since graduation). Certainly, the job search motive cannot be ruled out as an important factor underlying this behavior.

Specification of the Nurse Retention Regressions

The explanatory variables used in this chapter's analysis of nurse retention in current employment have been classified into three categories: (1) characteristics of the professional nurse; (2) characteristics of the professional nurse in relation to her present job; and (3) characteristics of the professional nurse's employer.

The first category includes variables reflecting the nurse's willingness to be in the labor force, such as her age, race, ethnicity, number of children by age, health status, spouse earnings and family income from nonemployment sources, past history of job changes, and type of basic nursing program attended. Nurses who have comparatively little attachment to the labor force because of personal circumstances are not likely to be very interested in other jobs. Moreover, as such variables as spouse earnings rise, the likelihood increases that the family's total income would fall (holding other factors constant) if the family moved. Separate regressions are presented for married and unmarried (single, separated, divorced, and widowed) nurses.

The following variables fall into the category "characteristics of the RN in relation to present job." Nurses employed part time

are less likely to lose fringe benefits if they leave their current employer, whereas full-time nurses may lose such benefits as the employer's contribution to their retirement plan, and/or they may have to go through a "waiting period" with a new employer before all health insurance coverage becomes complete again. Moreover, hospitals are less likely to make specific investments in nurses employed on a part-time basis. Specialized, as opposed to general, training raises the nurse's productivity in her current employment, relative to alternative settings. The part-time nurse has potentially less to lose by leaving her current employer and thus may be more mobile. Variables describing the nurse's full- or part-time status are: HRSWK1 for nurses working 20 hours or less per week, HRSWK2 for nurses working more than 20 but less than 35 hours per week, and WKSWK, which takes the value 1 if the nurse worked fewer than 40 weeks during 1972.

Length of time with the nurse's current employer (PRESJOB, expressed in years) merits inclusion for two reasons. First prerogatives of seniority potentially encompass nonpecuniary as well as pecuniary benefits to the nurse; and second, nurses who have been with a hospital for a long time are likely to possess greater amounts of hospital-specific training.

Although the hospital may offer a wage differential for evening and night work, the differential may often be insufficient in many instances to offset the disadvantages of these work hours. Likewise, nurses trained but not working in a specialty, and nurses without a regular shift assignment may feel their jobs are undesirable. The variables NWKSPEC (=1 if the nurse has a specialty but is not now working in it), SHIFTS (=1 if the nurse works more than a single, regular shift), and ENSHIFT (=1 if the nurse works on single, regular evening or night shift) represent these influences.

Nurses who may have part or all of their educational loans forgiven by working full time for their current employer have an added incentive to remain. Two variables are included to test the effect of loan forgiveness on nurse retention: LF1 (=1 if the nurse has an educational debt subject to additional loan forgiveness if she works full time for her current employer); and LF3 (=1 if the nurse has any type of educational debt outstanding, from all sources other than from relatives).[7] As defined, the variable LF1 and LF3 are not mutually exclusive. In general, nurses with debts are expected to remain in the labor force longer;[8] and retention should be higher for nurses who are eligible for loan

[7] A variable LF2 was included in Sloan (1975). The numbering of the variables has been kept the same in the interest of making comparisons easier.

[8] See Sloan (1975) for a conceptual discussion.

forgiveness if they work full time for their current employer.

The nurse wage variable (WAGEDIF) is defined as the difference between nurse wage rate *predicted* for each nurse from an hourly wage regression and the nurse's *actual*, reported wage.[9] As the predicted wage increases relative to the actual wage, the likelihood increases that the nurse could earn more if she were employed elsewhere. Thus, WAGEDIF is expected to have a negative impact on nurse retention in current employment.

"Characteristics of the nurse's employer" encompass a wide range of hospital attributes. Hospitals affiliated with medical schools (MDSCL = 1 if hospital has affiliation) may provide comparatively poor career advancement, because the nurse's professional status may frequently be lower in this setting. Nurse retention may be expected to be lower in hospitals affiliated with nursing schools (RNSCL = 1 if hospital has affiliation) as such hospitals often provide employment for their own graduates who may use the time after graduation to "shop around" for a better position, while enjoying the advantage of being employed in the interim.[10]

The following explanatory variables directly relate to the desirability of an employer from the nurse's vantage point. In all cases, professional nurses are eligible for the benefit.

HOUS	=	1 if hospital provides housing
DAYCARE	=	1 if hospital provides some form of day care
LINS	=	1 if hospital offers life insurance
HINS	=	1 if hospital offers basic and major medical health insurance
DISINS	=	1 if hospital offers sickness and disability insurance (other than workman's compensation)
RET	=	1 if hospital offers retirement plan in addition to Social Security
UNSAFPK	=	1 if hospital's parking areas are only moderately safe or unsafe
PROMOT	=	percentage of full-time nursing staff supervisory positions filled through internal promotion
ISED	=	1 if hospital offers and specifically budgets scheduled inservice education courses
WKSHOP	=	1 if hospital gives released time with pay to participate in workshops, conferences, courses, etc.
EDPAY1	=	1 if hospital pays all fees for continuing education

[9] The wage rate regression is presented in Sloan (1975, pp. 188–191).
[10] See Nash (1975) for pertinent data on this point.

EDPAY2 = 1 if hospital pays for portion of fees for continuing education

SCHED = 1 if nurse can frequently determine her own scheduling

The Survey of Registered Nurses contains a number of candidates for dependent variables in the empirical analysis of nurse retention in current employment. Each dependent variable involves a different aspect of retention. However, in all cases, if nurses are satisfied with their current job, there should be a higher propensity to rule out alternative employment settings, including work as a full-time housewife. The dependent variables in the analysis are based on the following questions that nurses were asked: "Are you (check one) thinking about getting a job, actually looking for a new job, stopping work, planning on keeping your present job?" In forming the dependent variable based on this question, responses "thinking about getting a new job" and "actually looking for a new job" have been combined.

The remaining questions pertinent to the retention analysis probe nurse attitudes toward within-State moves.

> Would you be willing to move to another community within the same state if you could earn more money there? yes ____; yes, but money does not matter ____; no ____.
>
> Would you consider employment in the following areas if you could earn more money there? Does not apply since I currently work in such an area; yes, even if I had to move; yes, if I did *not* have to move; yes, but money is not important; probably not; no.

The areas mentioned to the nurse were small community (less than 20,000 population) and poor section of a metropolitan area (income per four-person family under $4,000 per year).

A question on nurse willingness to move to another State was also asked, but the regression results based on this question have proved to be very similar to those for within-State moves; although the percentage of nurses willing to consider interstate moves is somewhat lower. Therefore, only results of within-State moves are presented here. All nurses who said they "already work in such an area" have been eliminated from the analysis; thus, all remaining nurses currently work in areas other than the type being considered. The five remaining alternative responses have been combined into three: "yes, I would consider employment in such an area"; "yes, if I did not have to move", and "I would not consider employment in a _____ area."

It should be emphasized that attitudinal responses reflect predispositions. There is no way of really knowing how the nurse would respond if she were confronted with an actual offer.

Generating offers as part of a social experiment would probably yield more conclusive information on nurse retention, but that kind of research is very costly to conduct.

Separate logit regressions are estimated for married and unmarried nurses.

Empirical Results

Table 19 presents a list of concise definitions of nurse retention variables. Tables 20 through 27 contain results of multiple logit

Table 19.—Concise definitions: Nurse retention analysis

AADEG	Nurse received an Associate of Arts degree
AGE	Nurse's age
BADEG	Nurse received a Bachelor of Arts degree
BLACK	Nurse is black
CHILD1	Nurse has children residing with her younger than 2 years old
CHILD2	Nurse has children residing with her between 2 and 6 years old
CHILD3	Nurse has children residing with her between 7 and 18 years old
CHILD4	Nurse has children residing with her over 18 years old and/or children receiving financial support for college education
DAYCARE	Hospital provides some form of day care for nurse's children
DEP	Nurse has adults receiving financial support from her family
DISINS	Nurse's hospital offers sickness and disability insurance (other than workman's compensation)
EDPAY1	Hospital pays all of the cost of tuition and related fees for continuing education courses leading to a degree
EDPAY2	Hospital pays part of the cost of tuition and related fees for continuing education courses leading to a degree
HEALTH	Nurse's health limits her activity
HINS	Nurse's hospital offers basic and major medical health insurance
HOUS	Nurse's hospital provides housing for RN employees
HRSWK1	Nurse works 20 or less hours per week
HRSWK2	Nurse works 21 to 34 hours per week
ISED	Nurse's hospital offers and specifically budgets scheduled in-service education courses
LF1	Nurse is eligible for additional forgiveness of loan if she continues to work for current hospital
LF3	Nurse has debt that is not subject to loan forgiveness
LINS	Nurse's hospital offers life insurance to RNs
MDSCL	Nurse's hospital affiliated with a medical school
NONEMPY	Level of nonemployment earnings received in 1972
ENSHIFT	Nurse works evening or night shift
NUBJOB	Number of jobs nurse has had divided by number of years since nurse completed nurse training
NWKSPEC	Nurse is qualified but not working in her specialty
OTHER	Nurse is widowed, separated, or divorced
PRESJOB	Number of years nurse has held present job
PROMOT	Percentage of full-time nursing staff supervisory positions filled through internal promotion

Table 19.—Concise definitions: Nurse retention analysis—Continued

RET	Hospital offers RNs retirement plan in addition to social security
RNUR	Nurse's hospital affiliated with a degree-granting nursing school or offers an RN diploma
SCHED	RN frequently determines her own scheduling
SEARN	Leverl of earnings of nurse's spouse
SHIFTS	Nurse rotates among shifts
SPORIEN	Nurse is of Spanish or Oriental race
UNSAFPK	Hospital parking areas are only moderately safe or unsafe
WAGEDIF	Predicted less actual wage
WKSHOP	Nurse's hospital gives released time with pay to participate in workshops, conferences, courses, etc.
WKSWK	Nurse worked less than 40 weeks in 1972 and graduated before 1972

analysis of responses to the questions from the Survey of Registered Nurses. The even-numbered tables present logit parameter estimates and tests of statistical significance. The odd-numbered tables report predicted probabilities, based on the logit parameter estimates and assumed values of selected explanatory variables; these tables assess the magnitude of changes in the predicted probabilities to changes in the levels of selected explanatory variables.

A number of other aspects of the tables must, however, be explained before considering specific empirical results in detail. Two points specifically apply to the even-numbered tables. First, a total of 40 explanatory variables have been considered for inclusion in the logit analysis, an excessive number even with a large sample, particularly since there are three groups of respondents in each of the tables. Given that the number of parameters to be estimated in logit analysis is $(m-1) \cdot n$, where m and n are, respectively, the number of groups and the number of explanatory variables *and* the constant term, the number of estimated parameters increases markedly as one increases either m and/or n (see appendix D).

The following rather imperfect method has been used to limit the number of explanatory variables in the regressions. Prior to estimating the regressions, variable means for each of the groups were examined. Explanatory variables exhibiting very little intergroup variation and ones for which the conceptual argument for inclusion is not as strong as for other variables have been eliminated from the logit regressions. There is admittedly some danger in making inferences about the partial effect of an explanatory variable (i.e., the effect when several other influences are held constant) from variable means. In fact, the possi-

bility of such differences provides the rationale for multivariate analysis as opposed to two-way tabular analysis. All one can really say is that if there is substantial intergroup variation in the means of a particular explanatory variable, there is a somewhat greater likelihood that the variable will prove to be important in multivariate analysis.

The second aspect of the even-numbered tables pertains to the group means themselves. Tables 20, 22, 24, and 26 contain group means for all 40 variables, regardless of whether the variable has ultimately been included in a regression. The interpretation of group means is best seen by a specific illustration; for example, AGE of married nurses in table 20. The mean age of nurses "looking for a new job or thinking about it" is 28.77 as opposed to a mean age of 34.17 for married nurses "planning on keeping present job." This type of comparison is rather straight forward. The interpretation of means relating to a binary variable, such as BLACK, is a bit more subtle. Again, with reference to married nurses, it is evident that the means for the three dependent variable groups are, respectively, 0.02, 0.03, and 0.02. From this information, one learns that of all married professional nurses who were "looking for a new job or thinking about it," 2 percent were black. The remainder were nurses of *all* nonblack races.

In generating the predicted probabilities presented in the odd-numbered tables, it has been necessary to focus on variables that demonstrate significant or nearly significant impacts in the even-numbered tables. Otherwise, there would be too many calculations, and important relationships would be obscured. Even if the effect of one explanatory variable is not being specifically assessed, it is necessary to make assumptions about its level. In the interest of simplicity, the values of binary variables not specifically assessed have been set at zero; levels of continuous variables have been set at their grand (averaging over all groups) means. Additional detail on assumptions is provided in the notes to the odd-numbered tables.

Choice Between Staying with Current Employer and Alternatives

Tables 20 and 21 contains the results of logit analysis designed to distinguish between nurses "looking for a new job or thinking about it," "thinking about stopping work," and "planning on keeping present job." This is the only dependent variable considered in this section that specifies leaving the labor force as an alternative. The probabilities of belonging to each of the three dependent variable groups are 0.18, 0.05, and 0.78 for married nurses, and 0.32, 0.02, and 0.66 for unmarried nurses. Married

Table 20.—Choice between staying with employer and alternatives: Means and logit analysis

	Married professional nurses						Unmarried professional nurses					
	Group means			Estimated logit functions			Group means			Estimated logit functions		
	Looking for a new job or thinking about it (1)	Thinking about stopping work (2)	Planning on keeping present job (3)	$\log_e(P_1/P_3)$	$\log_e(P_2/P_3)$	χ^2(2 d.f.)	Looking for a new job or thinking about it (1)	Thinking about stopping work (2)	Planning on keeping present job (3)	$\log_e(P_1/P_3)$	$\log_e(P_2/P_3)$	χ^2(2 d.f.)
Characteristics of RN												
AGE	28.77	31.56	34.17	−0.05	−0.01	[1] 15.77	26.37	39.00	31.19	−0.06	0.10	[1] 20.71
BLACK	0.02	0.03	0.02	–	–	–	0.03	0.13	0.04	–	–	–
SPORIEN	0.04	0.01	0.03	–	–	–	0.03	0.00	0.03	–	–	–
OTHER	–	–	–	–	–	–	0.18	0.31	0.34	−0.24	−0.42	0.93
HEALTH	0.02	0.10	0.03	0.10	1.72	[1] 13.25	0.00	0.25	0.02	−2.25	0.31	[2] 7.66
CHILD1	0.12	0.16	0.12	−0.26	0.15	1.77	0.02	0.06	0.04	−0.90	1.70	4.79
CHILD2	0.30	0.53	0.35	−0.14	0.27	4.36	0.06	0.06	0.11	−0.54	0.45	3.49
CHILD3	0.50	0.57	0.87	−0.00	−0.16	1.39	0.22	0.00	0.24	0.21	−1.29	2.67
CHILD4	0.11	0.08	0.19	0.10	−0.27	2.19	0.05	0.10	0.09	−0.02	0.57	1.01
DEP	0.08	0.01	0.08	0.15	−0.91	1.55	0.04	0.06	0.05	0.42	−0.38	1.42
SEARN	8,774.00	9,890.00	9,588.00	0.00000	0.00003	1.41	–	–	–	–	–	–
NONEMPY	400.00	200.00	200.00	0.0002	−0.002	1.66	200.00	400.00	300.00	−0.00	0.00	0.31
NUMJOB	0.69	0.53	0.51	−0.11	−0.32	1.02	0.71	0.65	0.61	0.04	0.73	1.75
AADEG	0.16	0.09	0.13	0.12	−0.21	0.62	0.19	0.06	0.19	0.08	−0.02	0.11
BADEG	0.20	0.19	0.11	0.38	0.40	4.41	0.24	0.38	0.18	0.09	1.74	5.12
Characteristics of RN in relation to present job												
NWKSPEC	0.08	0.04	0.07	0.10	−0.66	1.36	0.04	0.06	0.04	0.17	0.84	0.53
SHIFTS	0.36	0.28	0.26	0.16	−0.02	1.02	0.46	0.31	0.41	−0.05	−0.44	0.50
ENSHIFT	0.37	0.41	0.39	–	–	–	0.32	0.44	0.36	–	–	–
PRESJOB	2.07	3.08	3.83	−0.08	−0.03	6.73	2.14	3.93	2.87	0.03	−0.02	1.53
HRSWK1	0.08	0.19	0.14	–	–	–	0.004	0.00	0.02	–	–	–
HWSWK2	0.16	0.15	0.17	–	–	–	0.03	0.13	0.04	–	–	–
WKSWK	0.15	0.26	0.17	–	–	–	0.07	0.19	0.07	–	–	–

Table 20.—Choice between staying with employer and alternatives: Means and logit analysis—Continued

	Married professional nurses						Unmarried professional nurses					
	Group means			Estimated logit functions			Group means			Estimated logit functions		
	Looking for a new job or thinking about it (1)	Thinking about stopping work (2)	Planning on keeping present job (3)	$\log_e(P_1/P_3)$	$\log_e(P_2/P_3)$	χ^2(2 d.f.)	Looking for a new job or thinking about it (1)	Thinking about stopping work (2)	Planning on keeping present job (3)	$\log_e(P_1/P_3)$	$\log_e(P_2/P_3)$	χ^2(2 d.f.)
LF1	0.08	0.06	0.04	–	–	–	0.06	0.00	0.05	–	–	–
LF3	0.41	0.32	0.27	0.15	−0.03	0.93	0.41	0.44	0.33	0.13	1.54	5.02
WAGEDIF	−0.09	0.05	−0.01	−0.08	0.08	1.91	−0.01	−0.12	0.03	−0.13	−0.17	2.17
Charateristics of RN's employer												
MISCL	0.37	0.35	0.25	0.07	0.47	2.11	0.50	0.63	0.46	0.03	0.18	3.48
RNUR	0.65	0.57	0.52	0.29	0.04	2.97	0.67	0.69	0.68	−0.27	−0.14	1.70
HOUS	0.13	0.09	0.11	–	–	–	0.23	0.19	0.20	–	–	–
DAYCARE	0.09	0.09	0.05	–	–	–	0.05	0.06	0.09	–	–	–
LINS	0.84	0.85	0.76	–	–	–	0.83	0.63	0.83	–	–	–
HINS	0.67	0.57	0.64	–	–	–	0.69	0.69	0.71	–	–	–
DISINS	0.47	0.49	0.41	–	–	–	0.50	0.19	0.44	–	–	–
RET	0.79	0.74	0.69	–	–	–	0.72	0.63	0.73	–	–	–
UNSAFPK	0.36	0.29	0.30	0.14	−0.27	1.77	0.40	0.31	0.38	−0.01	−0.91	1.66
PROMOT	84.63	83.12	86.37	−0.008	−0.001	1.53	80.07	77.81	85.74	−0.01	−0.01	[2] 8.43
ISED	0.83	0.74	0.77	0.18	−0.21	1.40	0.78	0.69	0.83	−0.42	0.15	3.64
WKSHOP	0.68	0.78	0.75	–	–	–	0.69	0.75	0.74	–	–	–
EDPAY1	0.08	0.10	0.07	–	–	–	0.10	0.06	0.14	–	–	–
EDPAY2	0.30	0.18	0.23	–	–	–	0.36	0.38	0.30	–	–	–
SCHED	0.43	0.38	0.47	−0.11	−0.44	2.96	0.39	0.31	0.39	−0.06	−0.64	0.93
CONSTANTS	–	–	–	0.24	−1.82	–	–	–	–	2.06	−7.23	–
				R^2=0.14			R^2=0.23					
				χ^2= 142.11 (46. d.f.)			χ^2 = [1] 109.21 (46 d.f.)					

[1] Statistically significant at the 1-percent level.
[2] Statistically significant at the 5-percent level.

nurses are less likely to remain with their current employers; leaving employment entirely is a very unusual occurrence for the unmarried nurses in this sample.

Viewing table 20 in general terms, variables relating to the characteristics of the nurse and her family are clearly the most important ones for purposes of distinguishing among the three groups. This general finding holds for logit regressions presented in succeeding tables as well.

Within the nurse characteristics variable category, nurse age is by far the most significant. The mean age of nurses planning to remain with their current employers is higher than for nurses in the planning-to-leave groups. The fall in the expected length of stay on the current job after age 60, evident in the Sloan's (1975) regression, cannot be measured here, given the linear specification of the age variables. Linear specifications have been used in this chapter so as to permit a greater number of explanatory variables to be considered in the logit analysis.

Part of any nonlinear effect of age on job retention is undoubtedly captured by the "poor health" variable (HEALTH). Health considerations are an element in deciding whether to stop working, but job-searchers and job-stayers are virtually indistinguishable with regard to personal health.

As anticipated, married nurses "thinking about stopping work" have spouses with higher annual earnings. However, controlling for other factors in the logit analysis, the spouse earnings variable SEARN does not show a statistically significant impact.

Comparisons among variable means also indicate that nurses who have had more positions per elapsed year since graduation (NUMJOB) and, for those married, nurses with associate and baccalaureate degrees are more likely to be job-searchers, but in the unmarried nurse logit regressions these variables have insignificant effects.

In a regression reported in Sloan (1975), WAGEDIF had the anticipated negative (and statistically significant) impact on the nurse's expected stay with current employer. Since the wage difference variable relates to differences in the wage a nurse with a given set of characteristics could expect on the average to earn elsewhere and her actual wage, the variable's effect on continued labor force participation is ambiguous. But the variable should surely distinguish between job-searchers and job-stayers. Yet, neither the WAGEDIF variable means nor the logit analysis is encouraging on this count.

At least in the married regression, job tenure (PRESJOB), one of the variables describing characteristics of the nurse in rela-

tion to her present employers, relates to retention in the expected direction. Relatively recent employees are much more likely to search for other jobs. This factor is a much less reliable predictor of retention in the unmarried regression. In general, it has been difficult to explain mobility and hours-of-work patterns of unmarried nurses *and of* unmarried adult females on the whole in this, as well as in other studies. None of the other variables in the second explanatory category is useful for distinguishing between job-stayers and potential job-leavers.

About the only plausible result derivable from the list of characteristics of the nurse's employer pertains to internal promotions to nursing supervisory positions (PROMOT). Even though PROMOT's means are consistent with expectations for both married and unmarried nurses, statistical significance is only obtained in the regression for the unmarried.

Table 21 presents predicted probabilities based on table 20 logit parameter estimates and assumed values of the explanatory variables. The variable AGE's impact is clearly evident. Comparing married nurse variants 1 and 4, which differ only one nurse age, the probability that a nurse aged 32 plans to remain is 0.08 higher than for a nurse who is 10 years younger. The difference for unmarried nurses (compare unmarried nurse variants 1 and 4) is almost twice this great. By the time a married nurse is 52 and has 20 years experience with her current employer, the probability that she is "looking for a new job or thinking about it" is virtually nil (0.01).

The impacts of poor health may be assessed with reference to married and unmarried nurse variants 8 and 9. Poor health has a greater effect in the case of married nurses. More than any other, the variable HEALTH accounts for planned exits from the labor force.

Effects of having a child under age 2 and having a baccalaureate, as opposed to a diploma in nursing, are also assessed in table 21. According to the table, the presence of a young child lowers the probability of job searching. Baccalaureates tend to be comparatively mobile, a result supported by other studies.

Willingness to Move to Another Within-State Community

Table 22 examines differences among nurses who "would move to another community within a state for a salary increase"; "would move to another community but salary doesn't matter"; and "would not move to another community within the state even if salary were increased." Among married nurses, the proportions belonging to each of the groups are 0.10, 0.11, and 0.79 respectively; the corresponding proportions for unmarried

Table 21.—Choice between staying with employer and alternative: Predicted probabilities

Marital status	Variant	AGE	HEALTH	CHILD1	BADEG	PRESJOB	[1] $\hat{P}_1$	$\hat{P}_2$	$\hat{P}_3$
Married	1	22	0	0	0	0.5	0.23	0.04	0.72
Married	2	22	0	0	1	0.5	0.30	0.06	0.64
Married	3	22	0	1	0	0.5	0.19	0.05	0.76
Married	4	32	0	0	0	0.5	0.16	0.04	0.80
Married	5	32	0	0	0	5.0	0.11	0.04	0.85
Married	6	32	0	0	0	10.0	0.08	0.04	0.88
Married	7	52	0	0	0	10.0	0.03	0.03	0.94
Married	8	52	0	0	0	20.0	0.01	0.02	0.96
Married	9	52	1	0	0	20.0	0.01	0.12	0.87
Unmarried	1	22	0	0	0	0.5	0.43	0.00	0.57
Unmarried	2	22	0	0	1	0.5	0.44	0.01	0.55
Unmarried	3	22	0	1	0	0.5	0.23	0.01	0.76
Unmarried	4	32	0	0	0	0.5	0.29	0.01	0.71
Unmarried	5	32	0	0	0	5.0	0.32	0.00	0.68
Unmarried	6	32	0	0	0	10.0	0.35	0.00	0.65
Unmarried	7	52	0	0	0	10.0	0.13	0.04	0.83
Unmarried	8	52	0	0	0	20.0	0.17	0.03	0.79
Unmarried	9	52	1	0	0	20.0	0.02	0.05	0.93

[1] Probabilities may not sum to 1 because of rounding error. All married nurse calculations assume SEARN, NONEMPY, NUMJOB, and PROMOT at mean values. All unmarried nurse calculations assume OTHER=1 and NONEMPY, NUMJOB, and PROMOT at mean values.

Table 22.—Willingness to move to another community within a State: Means and logit analysis

	Married professional nurses						Unmarried professional nurses					
	Group means			Estimated logit functions			Group means			Estimated logit functions		
	Would move to another community within State for a salary increase (1)	Would move to another community within State but salary doesn't matter (2)	Would not move to another community within State even if salary increased (3)	$\log_e(P_1/P_3)$	$\log_e(P_2/P_3)$	χ^2(2 d.f.)	Would move to another community within State for a salary increase (1)	Would move to another community within State but salary doesn't matter (2)	Would not move to another community within State even if salary increased (3)	$\log_e(P_1/P_3)$	$\log_e(P_2/P_3)$	χ^2(2 d.f.)
Characteristics of RN												
AGE	27.70	29.70	34.07	−0.10	−0.03	[1] 24.82	28.11	25.17	32.18	−0.02	−0.08	[1] 17.23
BLACK	0.06	0.02	0.02	–	–	–	0.07	0.03	0.03	–	–	–
SPORIEN	0.05	0.06	0.02	–	–	–	0.02	0.04	0.03	–	–	–
OTHER	–	–	–	–	–	–	0.33	0.13	0.34	0.63	−0.20	[2] 6.11
HEALTH	0.01	0.04	0.03	−0.07	0.06	2.84	0.01	0.01	0.04	−1.02	−1.00	1.56
CHILD1	0.17	0.12	0.11	0.18	−0.35	2.50	0.05	0.03	0.03	0.17	0.04	0.16
CHILD2	0.31	0.27	0.36	−0.10	−0.28	3.68	0.11	0.05	0.10	−0.10	−0.20	0.36
CHILD3	0.54	0.43	0.87	0.25	−0.18	[1] 9.68	0.29	0.08	0.77	0.07	−0.29	2.44
CHILD4	0.16	0.13	0.18	0.37	0.03	[2] 6.21	0.08	0.03	0.08	0.01	0.36	1.09
DEP	0.02	0.10	0.07	−0.32	0.35	3.35	0.05	0.06	0.06	0.09	−1.43	2.29
SEARN	7,334.00	8,678.30	9,828.00	−0.00007	−0.00001	[1] 14.03	–	–	–	–	–	–
NONEMPY	300.00	500.00	400.00	−0.0002	0.0001	4.07	200.00	200.00	400.00	−0.0004	−0.00002	5.22
NUMJOB	0.71	0.67	0.51	−0.13	−0.03	0.36	7.52	7.07	5.74	0.24	0.009	1.93
AADEG	0.15	0.20	0.12	−0.14	0.39	3.22	0.25	0.17	0.17	0.23	−0.05	1.07
BADEG	0.17	0.18	0.12	−0.05	0.26	1.26	0.19	0.30	0.18	−0.10	0.03	2.26
Characteristics of RN in relation to present job												
NWKSPEC	0.05	0.08	0.08	−0.24	−0.05	0.37	0.06	0.02	0.05	0.39	−0.14	0.93
SHIFTS	0.38	0.27	0.27	0.15	−0.37	4.07	0.48	0.48	0.37	0.37	0.11	3.14
ENSHIFT	0.38	0.37	0.39	–	–	–	0.28	0.33	0.39	–	–	–
PRESJOB	2.07	2.41	3.81	−0.60	−0.43	3.89	1.61	2.11	3.21	−0.09	0.03	[2] 6.81
HRSWK1	0.05	0.06	0.15	–	–	–	0.01	0.01	0.02	–	–	–

HRSWK2	0.07	0.12	0.19	–	–	–	0.03	0.02	0.05	–	–	–
WKSWK	0.13	0.15	6.18	–	–	–	0.06	0.05	0.09	–	–	–
LF1	0.09	0.07	0.04	–	–	–	0.07	0.07	0.05	–	–	–
LF3	0.39	0.43	0.27	0.04	0.35	3.48	0.39	0.39	0.34	−0.06	−0.16	0.59
WAGEDIF	−0.02	−0.04	−0.01	−0.03	−0.03	0.16	−0.05	−0.06	0.05	−0.09	0.00	0.91
Characteristics of RN's employer												
MD&CL	0.32	0.34	0.26	−0.24	0.23	2.45	0.52	0.55	0.44	0.14	0.24	1.04
RNUR	0.66	0.60	0.53	0.44	0.05	4.45	0.69	0.73	0.65	−0.00	−0.02	0.01
HOUS	0.13	0.14	0.11	–	–	–	0.25	0.24	0.18	–	–	–
DAYCARE	0.07	0.10	0.06	–	–	–	0.10	0.11	0.05	–	–	–
LINS	0.79	0.82	0.77	–	–	–	0.87	0.82	0.81	–	–	–
HINS	0.60	0.62	0.65	–	–	–	0.71	0.74	0.69	–	–	–
DISINS	0.38	0.45	0.42	–	–	–	0.44	0.39	0.47	–	–	–
RET	0.68	0.81	0.70	–	–	–	0.69	0.81	0.71	–	–	–
UNSAFPK	0.36	0.30	0.30	0.24	−0.13	2.13	0.41	0.38	0.37	0.12	−0.29	2.55
PROMOT	86.00	84.82	85.99	0.002	−0.001	0.26	84.61	81.11	84.38	0.002	−0.004	1.50
ISED	0.80	0.80	0.78	−0.01	0.01	0.00	0.83	0.82	0.81	0.01	−0.04	0.02
WKSHOP	0.70	0.71	0.74	–	–	–	0.70	0.73	0.73	–	–	–
EDPAY1	0.10	0.09	0.07	–	–	–	0.13	0.10	0.14	–	–	–
EDPAY2	0.26	0.33	0.22	–	–	–	0.30	0.41	0.29	–	–	–
SCHED	0.40	0.48	0.46	–	–	–	0.31	0.39	0.41	–	–	–
CONSTANTS	–	–	–	1.27	−0.66	–	–	–	–	−0.82	1.30	–
			R^2=0.14			R^2=0.19						
			χ^2 = [1] 154.61 (44 d.f.)			χ^2 = [1] 119.78 (44 d.f.)						

[1] Statistically significant at the 1-percent level.
[2] Statistically significant at the 5-percent level.

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nurses are 0.22, 0.23, and 0.54. Unmarried nurses are far more willing to move. The proportions in the two mobile nurse groups are approximately equal in the case of married as well as unmarried nurses.

In contrast to the dependent variables analyzed in other parts of this section, the choices analyzed in table 22 necessarily involve changes in the nurse's home address. The logit regression's specification is the same as table 20's with the exception that the variable SCHED (nurse "frequently" determines her own scheduling) has been eliminated from table 22's logit analysis.

As in table 20 personal and family characteristics variables dominate. For married nurses, the most significant variables are AGE and SEARN, annual earnings of spouse. The logit results also suggest that nurses who are mothers of school age children are more likely to consider moving. This result is counterintuitive and is not supported by the other tables in this chapter. The notion that nurses married to high earners are less likely to move in the interests of the nurse's career is a believable result, irrespective of one's views about the desirability of this pattern of family decisionmaking. In table 20, SEARN proved to be unimportant. But a job change per se need not involve a change in location of residence. Age also dominates the regression for the unmarried nurses. Nurses who have never married (for whom OTHER = 0) are less likely to move to another community than nurses who have been married one or more times.

Length of time on current job (PRESJOB) has a plausibly negative impact on willingness to move for additional salary to another community, but the impact on willingness to move for reasons other than money is positive, absolute value. In the married nurse's regression, increases in PRESJOB lower the probability of belonging to both of the two "mobile" groups, but the relationship is not statistically significant at conventional levels.

The effect of characteristics of the nurse's employer is neither evident from comparisions of the group means nor from the logit regressions. Group means for the vast majority of these explanatory variables are very close to one another. It is possible that a nurse's attitude toward making a move to another community does not reflect the degree to which the nurse is satisfied with her current employer. However, if characteristics of the nurse's employer are important, plausible patterns should be evident in at least some of the tables.

As seen with reference to table 23 predicted probabilities, AGE and SEARN have substantial impacts on the probability on nurse retention in current employment when moves to another

Table 23.—Willingness to move to another community within a State: Predicted probabilities

Marital status	Variant	AGE	SEARN	NONEMPY	PRESJOB	OTHER	[1] $\hat{P}_1$	$\hat{P}_2$	$\hat{P}_3$
Married	1	22	3,000	100	0.5	–	0.21	0.15	0.64
Married	2	22	5,000	100	0.5	–	0.19	0.15	0.66
Married	3	22	15,000	1,000	0.5	–	0.09	0.17	0.74
Married	4	22	25,000	1,000	0.5	–	0.05	0.16	0.79
Married	5	22	5,000	100	0.5	–	0.16	0.17	0.67
Married	6	32	15,000	1,000	0.5	–	0.04	0.14	0.83
Married	7	32	15,000	1,000	5.0	–	0.03	0.12	0.85
Married	8	32	15,000	1,000	10.0	–	0.02	0.10	0.88
Married	9	32	25,000	100	10.0	–	0.01	0.09	0.90
Married	10	52	25,000	1,000	5.0	–	0.00	0.06	0.93
Unmarried	1	22	–	100	0.5	1	0.33	0.18	0.49
Unmarried	2	22	–	1,000	0.5	1	0.26	0.20	0.54
Unmarried	3	22	–	2,000	0.5	1	0.19	0.22	0.60
Unmarried	4	32	–	1,000	0.5	1	0.25	0.11	0.64
Unmarried	5	32	–	1,000	5.0	1	0.18	0.13	0.69
Unmarried	6	32	–	1,000	10.0	1	0.12	0.16	0.72
Unmarried	7	22	–	1,000	0.5	0	0.15	0.27	0.59
Unmarried	8	52	–	1,000	10.0	1	0.10	0.04	0.87
Unmarried	9	52	–	1,000	20.0	1	0.04	0.05	0.91

[1] Probabilities may not sum to 1 because of rounding error. All calculations assume NUMJOB and PROMOT at their mean values.

community are the alternative. The probability that a nurse of age 52 is willing to move is low in all variants in which this age is assumed. The impact of income from other sources than the nurse's salary is evident by comparing, for example, married variants 1 and 4. Combining nurse age and a high income from other sources, as in married nurse variant 10, the probability of moving for reasons of nurse salary is almost zero (zero in table 23 due to rounding).

Willingness to Consider Employment in a Rural Area

Table 24 examines nurses' propensity to leave current employment for employment in rural areas. The proportion *unwilling* to consider rural employment is only slightly higher for married nurses, 0.59 versus 0.54 for unmarried nurses. There are, however, substantial differences in willingness to move to rural areas. While the proportion of unmarried nurses willing to move to such areas is 0.32, the corresponding proportion for married is only 0.18. Nurses already working in rural areas have been excluded from table 24's analysis.

The results again support the view that older nurses are unwilling to change employers for employment in a rural area. A negative impact of spouse earnings on mobility of married nurses is observed, as in table 22. The job tenure pattern is evident for married but not unmarried nurses, a result contradictory to table 24's results. Although the never-married subcomponent of the unmarried component is less likely to move, the relationship is not statistically significant as in table 22.

Earlier research, published in Sloan (1975), indicated black nurses were resistant to working in rural areas. While the means in table 24 show this tendency to be true of black unmarried nurses, the pattern does not carry over to black married nurses. But tabulations presented in Sloan (1975) did not distinguish between black married and unmarried nurses. Logit regressions reveal that, holding a number of factors constant, the coefficients of BLACK are not statistically significant, even for unmarried nurses. Thus, the more in-depth analysis presented in this chapter does not show black nurses *not now* working in rural areas to be especially adverse to working in these areas. The proportion of white nurses working in rural areas is much higher than is the comparable proportion for blacks. Table 25 contains predicted probabilities based on table 24's logit coefficients. Young unmarried nurses in particular are quite willing to consider employment in rural areas. In contemplating this kind of job change, the vast majority of nurses in this category would take monetary factors into account.

Table 24.—Willingness to consider employment in a rural area: Means and logit analysis

	Married professional nurses						Unmarried professional nurses					
	Group means			Estimated logit functions			Group means			Estimated logit functions		
	Would consider employment in a rural area (1)	Would consider employment in a rural area if not required to move (2)	Would not consider employment in a rural area (3)	$\log_e(P_1/P_3)$	$\log_e(P_2/P_3)$	χ^2(2 d.f.)	Would consider employment in a rural area (1)	Would consider employment in a rural area if not required to move (2)	Would not consider employment in a rural area (3)	$\log_e(P_1/P_3)$	$\log_e(P_2/P_3)$	χ^2(2 d.f.)
Characteristics of RN												
AGE	28.83	30.65	34.99	−0.04	−0.03	[1]8.41	26.70	28.39	31.40	−0.07	−0.07	[1]19.59
BLACK	0.04	0.03	0.03	0.62	0.30	1.45	0.03	0.02	0.06	−1.08	−0.73	4.41
SPORIEN	0.02	0.01	0.04	−0.82	−1.43	4.55	0.02	0.00	0.03	−0.55	−9.42	0.72
OTHER	–	–	–	–	–	–	0.25	0.25	0.30	0.60	0.14	3.64
HEALTH	0.04	0.02	0.03	0.33	−0.26	0.78	0.01	0.04	0.02	0.08	1.25	2.37
CHILD1	0.09	0.14	0.11	−0.62	0.12	4.79	0.03	0.03	0.04	−0.34	−0.50	0.67
CHILD2	0.33	0.37	0.33	−0.01	−0.02	0.02	0.10	0.06	0.09	−0.05	−0.30	0.38
CHILD3	0.39	0.66	0.92	−0.14	−0.02	1.71	0.21	0.44	0.17	0.29	0.60	[1]10.62
CHILD4	0.11	0.13	0.23	0.03	−0.05	0.23	0.03	0.07	0.10	−0.57	−0.19	3.49
DEP	0.05	0.03	0.10	0.18	−0.28	1.02	0.04	0.04	0.04	0.05	0.06	1.44
SEARN	7,591.00	9,832.00	10,021.00	−0.00005	0.00001	[1]8.43	–	–	–	–	–	–
NONEMPY	500.00	400.00	400.00	0.00006	0.00009	1.48	200.00	200.00	300.00	−0.79	−0.13	0.74
NUMJOB	0.71	0.62	0.48	0.11	0.05	0.26	0.74	0.57	0.62	0.03	−0.32	1.67
AADEG	0.15	0.16	0.10	0.12	0.27	1.06	0.17	0.16	0.19	−0.4	−0.49	1.76
BADEG	0.21	0.14	0.13	0.12	−0.00	0.24	0.32	0.17	0.21	0.37	−0.32	4.40
Characteristics of RN in relation to present job												
NWKSPEC	0.07	0.08	0.07	0.16	0.28	0.73	0.03	0.01	0.05	−0.24	−1.29	1.41
SHIFTS	0.34	0.32	0.28	−0.30	−0.03	1.90	0.46	0.46	0.41	0.11	0.17	0.47
ENSHIFT	0.31	0.39	0.38	–	–	–	0.33	0.23	0.36	–	–	–
PRESJOB	2.13	2.67	4.23	−0.79	−0.05	[1]7.14	2.07	3.15	2.81	0.03	0.08	4.89
HRSWK1	0.08	0.11	0.14	–	–	–	0.01	0.01	0.02	–	–	–
HRSWK2	0.08	0.17	0.18	–	–	–	0.04	0.01	0.04	–	–	–
WKSWK	0.17	0.16	0.16	–	–	–	0.08	0.06	0.06	–	–	–

Table 24.—Willingness to consider employment in a rural area: Means and logit analysis—Continued

	Married professional nurses						Unmarried professional nurses					
	Group means			Estimated logit functions			Group means			Estimated logit functions		
	Would consider employment in a rural area (1)	Would consider employment in a rural area if not required to move (2)	Would not consider employment in a rural area (3)	$\log_e(P_1/P_3)$	$\log_e(P_2/P_3)$	χ^2(2 d.f.)	Would consider employment in a rural area (1)	Would consider employment in a rural area if not required to move (2)	Would not consider employment in a rural area (3)	$\log_e(P_1/P_3)$	$\log_e(P_2/P_3)$	χ^2(2 d.f.)
LF1	0.08	0.07	0.04	–	–	–	0.08	0.06	0.05	–	–	–
LF3	0.41	0.36	0.27	0.07	0.06	0.16	0.35	0.37	0.36	−0.26	−0.05	1.53
WAGEDIF	−0.10	0.03	−0.08	−0.04	0.11	1.89	0.02	−0.09	−0.02	0.02	−0.18	2.08
Characteristics of RN's employer												
MDSCL	0.49	0.36	0.35	0.04	−0.41	4.24	0.59	0.48	0.55	−0.05	−0.16	0.24
RNUR	0.78	0.67	0.61	0.64	0.25	[1] 7.31	0.80	0.63	0.76	−0.04	−0.97	[2] 10.05
HOUS	0.13	0.16	0.13	–	–	–	0.22	0.20	0.20	–	–	–
DAYCARE	0.12	0.07	0.08	–	–	–	0.10	0.06	0.10	–	–	–
LINS	0.93	0.83	0.82	–	–	–	0.84	0.93	0.88	–	–	–
HINS	0.70	0.64	0.66	–	–	–	0.75	0.69	0.74	–	–	–
DISINS	0.44	0.39	0.42	–	–	–	0.41	0.52	0.49	–	–	–
RET	0.75	0.79	0.72	–	–	–	0.72	0.77	0.77	–	–	–
UNSAFPK	0.38	0.41	0.29	0.35	0.64	[2] 11.77	0.41	0.41	0.44	−0.27	−0.25	1.73
PROMOT	82.77	85.14	86.15	−0.004	−0.002	0.70	82.95	81.74	84.40	−0.004	−0.02	3.54
ISED	0.81	0.87	0.81	−0.30	0.31	3.84	0.81	0.86	0.84	−0.32	0.27	2.44
WKSHOP	0.78	0.68	0.74	–	–	–	0.12	0.74	0.75	–	–	–
EDPAY1	0.10	0.09	0.08	–	–	–	0.16	0.11	0.14	–	–	–
EDPAY2	0.28	0.33	0.21	–	–	–	0.34	0.31	0.34	–	–	–
SCHED	0.38	0.40	0.42	–	–	–	0.34	0.36	0.38	–	–	–
CONSTANTS	–	–	–	0.79	−0.30	–	–	–	–	1.87	2.47	–
				R^2=0.17			R^2=0.18					
				χ^2 = [1] 140.24 (48 d.f)			χ^2 = [1] 95.05 (48 d.f.)					

[1] Statistically significant at the 5-percent level.
[2] Statistically significant at the 1-percent level.

Table 25.—Willingness to consider employment in a rural area: Predicted probabilities

Marital status	Variant	AGE	BLACK	SPORIEN	SEARN	BADEG	PRESJOB	[1] $\hat{P}_1$	$\hat{P}_2$	$\hat{P}_3$
Married	1	22	0	0	5,000	0	0.5	0.28	0.19	0.53
Married	2	22	0	0	5,000	1	0.5	0.30	0.18	0.51
Married	3	22	0	1	5,000	0	0.5	0.18	0.06	0.76
Married	4	22	0	0	5,000	1	0.5	0.40	0.19	0.41
Married	5	22	0	0	25,000	0	0.5	0.12	0.27	0.62
Married	6	32	0	0	15,000	0	0.5	0.14	0.19	0.67
Married	7	32	0	0	15,000	0	5.0	0.10	0.17	0.73
Married	8	32	0	0	15,000	0	10.0	0.07	0.14	0.79
Married	9	52	0	0	15,000	0	10.0	0.04	0.09	0.88
Married	10	52	0	0	25,000	0	20.0	0.01	0.05	0.94
Unmarried	1	22	0	0	–	0	0.5	0.56	0.14	0.30
Unmarried	2	22	0	0	–	1	0.5	0.67	0.08	0.25
Unmarried	3	22	0	1	–	0	0.5	0.51	0.00	0.49
Unmarried	4	22	1	0	–	0	0.5	0.34	0.12	0.54
Unmarried	5	32	0	0	–	0	0.5	0.43	0.10	0.47
Unmarried	6	32	0	0	–	0	5.0	0.44	0.14	0.42
Unmarried	7	32	0	0	–	0	10.0	0.45	0.18	0.37
Unmarried	8	52	0	0	–	0	10.0	0.21	0.08	0.71
Unmarried	9	52	0	0	–	0	20.0	0.24	0.16	0.60

[1] Probabilities may not sum to 1 because of rounding error. All married nurse calculations assume NUMJOB and PROMOT at their mean values. All unmarried nurse calculations assume OTHER=1 and NONEMPY, NUMJOB, and PROMOT at their mean values.

Willingness to Consider Employment in a Poor Section of a Major Metropolitan Area

There are some major differences between the results in tables 24 and 26. First, AGE does not enter significantly in table 26's married regression, although the overall pattern implied by the coefficients is clearly similar. The mean age of married nurses unwilling to consider employment in a poor section of a metropolitan area is slightly over 4 years higher than that for nurses who would consider employment in this type of area, even if it were necessary to move. In table 24, where AGE is highly significant, the corresponding difference in mean age is slightly over 6 years.

Second, in marked contrast to table 24, spouse earnings (SEARN) does not have a statistically significant impact in table 26's married nurses' regression. Although the pattern in the means of SEARN is similar to table 24, the differences are not quite as great.

Third, an important conclusion of the Sloan (1975) study is that baccalaureate nurses would be less adverse to leaving current employment to work in a poor district of a major metropolitan area. This result is confirmed by table 26, particularly in the case of unmarried nurses. In contrast to small rural communities where baccalaureates are underrepresented, they are overrepresented in poor sections of metropolitan areas.

Fourth, table 26's job tenure means are consistent with table 24's suggesting that nurses who have been with the hospital for longer time periods are less likely to consider leaving for employment in a poor section. Yet the relationship between PRESJOB and the dependent variable is insignificant in both married and unmarried regressions. In fact, in the unmarried regression of table 26, the signs of the PRESJOB coefficients are implausible. This result probably means that job tenure does not have an effect in this table that is independent of nurse age and other factors.

Table 27 examines changes in predicted probabilities to changes in explanatory variables AGE, AADEG, BADEG, and PRESJOB. The probability that a diploma graduate is willing to work in a poor section of a major metropolitan area is substantially less than is true of her baccalaureate degree and associate degree colleagues. Again, one must remember that nurses already working in such an area have been excluded from the regression analysis. Baccalaureates are overrepresented among nurses already working there.

Table 26.—Willingness to consider employment in a poor section of a metropolitan area: Means and logit analysis

	Married professional nurses						Unmarried professional nurses					
	Group means			Estimated logit functions			Group means			Estimated logit functions		
	(1) Would consider employment in a poor section of a metropolitan area	(2) Would consider employment in a poor section of a metropolitan area if not required to move	(3) Wouldn't consider employment in a poor section of a metropolitan area	$\log_e(P_1/P_3)$	$\log_e(P_2/P_3)$	χ^2(2 d.f.)	(1) Would consider employment in a poor section of a metropolitan area	(2) Would consider employment in a poor section of a metropolitan area if not required to move	(3) Wouldn't consider employment in a poor section of a metropolitan area	$\log_e(P_1/P_3)$	$\log_e(P_2/P_3)$	χ^2(2 d.f.)
Characteristics of RN												
AGE	28.57	29.78	32.96	−0.04	−0.03	4.64	24.96	28.27	30.16	−0.11	−0.01	[1]10.15
BLACK	0.04	0.02	0.02	0.49	−0.46	1.23	0.04	0.04	0.04	−0.08	−0.02	0.01
SPORIEN	0.02	0.01	0.0	−0.43	−1.28	1.66	0.02	0.04	0.02	−0.19	0.50	0.46
OTHER	–	–	–	–	–	–	0.18	0.25	0.28	0.39	0.13	0.88
HEALTH	0.02	0.01	0.03	0.15	−0.74	1.06	0.00	0.02	0.02	−8.14	0.17	0.06
CHILD1	0.13	0.13	0.11	−0.16	0.14	0.60	0.01	0.05	0.04	−1.12	0.49	1.77
CHILD2	0.24	0.41	0.36	−0.22	0.16	2.91	0.09	0.11	0.09	−0.10	0.08	0.11
CHILD3	0.39	0.68	0.80	−0.09	−0.11	2.19	0.13	0.21	0.22	0.08	0.03	0.13
CHILD4	0.11	0.10	0.18	−0.01	−0.01	0.01	0.03	0.03	0.08	−0.03	−0.59	1.35
DEP	0.07	0.02	0.07	0.22	−0.69	2.19	0.05	0.04	0.05	0.58	0.16	1.13
SEARN	8,185.00	9,438.00	9,603.00	−0.00000	0.000	0.29	–	–	–	–	–	–
NONEMPY	700.00	500.00	400.00	0.0003	0.0001	[1]11.43	200.00	300.00	300.00	−0.000	0.0001	0.36
NUMJOB	0.74	0.67	0.53	0.12	0.21	1.21	0.73	0.57	0.64	−0.13	−0.33	1.47
AADEG	0.21	0.18	0.12	0.81	0.41	[5]7.94	0.16	0.14	0.20	−0.18	−0.42	1.04
BADEG	0.29	0.15	0.11	0.91	0.16	[5]8.98	0.40	0.27	0.20	0.77	0.17	[5]6.56
Characteristics of RN in relation to present job												
NWKSPEC	0.11	0.08	0.07	0.55	0.23	2.05	0.06	0.02	0.04	1.14	−0.77	4.40
SHIFTS	0.37	0.34	0.26	0.02	0.26	1.98	0.49	0.50	0.40	0.03	0.24	0.56
ENSHIFT	0.32	0.36	0.40	–	–	–	0.35	0.29	0.37	–	–	
PRESJOB	2.05	2.28	3.58	−0.04	−0.05	3.12	1.74	2.14	2.80	0.05	−0.04	1.56
HRSWK1	0.08	0.10	0.13	–	–	–	0.00	0.00	0.02	–	–	–
HRSWK2	0.17	0.20	0.17	–	–	–	0.05	0.02	0.04	–	–	–
WKSWK	0.13	0.17	0.17	–	–	–	0.11	0.04	0.06	–	–	–

Table 26.—Willingness to consider employment in a poor section of a metropolitan area: Means and logit analysis—Continued

	Married professional nurses						Unmarried professional nurses					
	Group means			Estimated logit functions			Group means			Estimated logit functions		
	Would consider employment in a poor section of a metropolitan area (1)	Would consider employment in a poor section of a metropolitan area if not required to move (2)	Wouldn't consider employment in a poor section of a metropolitan area (3)	$\log_e(P_1/P_3)$	$\log_e(P_2/P_3)$	χ^2(2 d.f.)	Would consider employment in a poor section of a metropolitan area (1)	Would consider employment in a poor section of a metropolitan area if not required to move (2)	Wouldn't consider employment in a poor section of a metropolitan area (3)	$\log_e(P_1/P_3)$	$\log_e(P_2/P_3)$	χ^2(2 d.f.)
LF1	0.11	0.07	0.05	–	–	–	0.06	0.07	0.06	–	–	–
LF3	0.40	0.34	0.29	0.10	−0.09	0.44	0.43	0.36	0.34	0.16	0.02	0.38
WAGEDIF	−0.08	0.02	−0.005	−0.09	0.01	0.51	0.01	0.02	0.04	−0.15	−0.06	1.10
Characteristics of RN's employer												
MDSCL	0.49	0.31	0.25	0.97	0.19	[1] 10.11	0.60	0.55	0.42	0.81	0.67	[2] 8.19
RNUR	0.62	0.57	0.53	−0.20	−0.05	0.51	0.67	0.64	0.68	−0.69	−0.78	[2] 8.18
HOUS	0.10	0.13	0.12	–	–	–	0.22	0.13	0.20	–	–	–
DAYCARE	0.04	0.05	0.06	–	–	–	0.09	0.11	0.08	–	–	–
LINS	0.82	0.79	0.78	–	–	–	0.80	0.86	0.85	–	–	–
HINS	0.69	0.66	0.64	–	–	–	0.74	0.77	0.72	–	–	–
DISINS	0.42	0.42	0.41	–	–	–	0.51	0.43	0.44	–	–	–
RET	0.73	0.73	0.70	–	–	–	0.71	0.77	0.73	–	–	–
UNSAFPK	0.33	0.31	0.30	−0.13	0.00	0.23	0.37	0.45	0.37	−0.40	−0.08	1.81
PROMOT	82.52	85.90	86.40	−0.003	−0.001	0.32	78.22	84.29	84.31	−0.007	0.003	1.93
ISED	0.76	0.84	0.76	−0.32	0.40	4.55	0.78	0.89	0.82	−0.13	0.74	2.75
WKSHOP	0.80	0.71	0.73	–	–	–	0.72	0.68	0.72	–	–	–
EDPAY1	0.13	0.9[illegible]	0.07	–	–	–	0.11	0.05	0.14	–	–	–
EDPAY2	0.23	0.28	0.22	–	–	–	0.35	0.29	0.31	–	–	–
SCHED	0.48	0.49	0.46	–	–	–	0.43	0.34	0.38	–	–	–
CONSTANTS	–	–	–	−1.29	−1.38	–	–	–	–	1.56	−2.32	–
				R^2=0.12			R^2=0.17					
				χ^2 = [1] 109.95 (48 d.f.)			χ^2 = [1] 69.18 (48 d.f.)					

[1] Statistically significant at the 1-percent level.
[2] Statistically significant at the 5-percent level.

Table 27.—Willingness to consider employment in a poor section of a metropolitan area: Predicted probabilities

Marital status	Variant	AGE	AADEG	BADEG	PRESJOB	[1] $\hat{P}_1$	$\hat{P}_2$	$\hat{P}_3$
Married	1	22	0	0	0.5	0.08	0.12	0.80
Married	2	22	0	1	0.5	0.18	0.12	0.70
Married	3	22	1	0	0.5	0.16	0.15	0.68
Married	4	32	0	0	0.5	0.06	0.09	0.85
Married	5	32	0	0	5.0	0.05	0.08	0.87
Married	6	52	0	0	5.0	0.02	0.05	0.93
Married	7	52	0	0	10.0	0.02	0.04	0.94
Unmarried	1	22	0	0	0.5	0.23	0.07	0.70
Unmarried	2	22	0	1	0.5	0.39	0.06	0.55
Unmarried	3	22	1	0	0.5	0.21	0.05	0.75
Unmarried	4	32	0	0	0.5	0.13	0.07	0.80
Unmarried	5	32	0	0	5.0	0.11	0.06	0.83
Unmarried	6	52	0	0	5.0	0.01	0.05	0.93
Unmarried	7	52	0	0	10.0	0.02	0.04	0.94

[1] Probabilities may not sum to 1 because of rounding error. All married nurse calculations assume SEARN, NONEMPY, NUMJOB, and PROMOT at their mean values. All unmarried nurse calculations assume OTHER=1 and NONEMPY, NUMJOB and PROMOT at their mean values.

Discussion and Conclusions

Without question, a few personal characteristics of the nurse dominate our empirical analysis of nurse retention in current employment. We have analyzed four dependent variables which measure different aspects of retention, and they all support this conclusion.

The most important determinants are (1) nurse age, (2) marital status, (3) spouse earnings of married nurses, (4) job tenure, and in one instance, (5) type of basic nursing program attended.

Characteristics of the nurse's employer typically have no explantory power in our analysis. This result is certainly consistent with Elnicki's (1975) results. Using a long list of hospital characteristics variables derived from the Survey of Hospital Directors of Nursing, Elnicki was able to explain only 2 percent of the variance in a regression with nurse turnover as the dependent variable. Many of the same explanatory variables have been employed in this chapter, with data obtained from the Survey of Registered Nurses forming the dependent variables. Given that this chapter confirms the earlier Elnicki study, it is possible to conclude with even greater confidence that specific offerings of the hospital have very little to do with nurse retention and turnover. In cases such as this, some will say poor results reflect errors in measurement. Better results presumably would have been obtained if our measures of hospital offerings were more precise. This is always a possibility, particularly when data from a mail questionnaire are used for analysis. A more in-depth study might be justified, but, for the time being, it appears that specific incentives, either financial or nonfinancial, have at most a minimal impact on retention.

To date, most economic research on turnover has been confined to interindustry differences in turnover rates, for example, Parsons (1972), Pencavel (1970, 1972), Stoikov and Raimon (1968). By contrast, research on the subject in the field of nursing has dealt with interhospital differences and variations among individual nurses. To my knowledge, although there have been comments about intraoccupational differences in turnover, e.g., among nurses, teachers, and social workers, there has been no formal analysis of such variation.

Interindustry studies have reported empirical results generally consistent with economic theory. Among the explanatory variables included in interindustry studies are wage rates, broad measures of occupational mix, union coverage, racial composition of employees, and industry concentration (in the product market). This chapter has considered one occupation within one industry. As a result, many of the more general explanatory

variables are not applicable here. Empirical analysis of broad differences among industries requires far less attention to institutional detail and careful measurement of pertinent explanatory factors, than in the type of analysis attempted here. The fact that similar specifications, however, have yielded plausible results gives one greater confidence that the poor results reported here do not reflect an egregious specification error.

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Chapter 7
NURSE DEMAND FOR NONWAGE BENEFITS

Frank A. Sloan

Introduction

As has been well documented by Rice (1966) and others, expenditures for major categories of supplements to wages have been growing in the United States far more rapidly than have wage expenditures themselves. Since supplements represent an increasingly important part of the total compensation package in the hospital sector as well, it is useful to consider ways in which these can be used by employers to obtain the maximum amount of labor services for a given total compensation bill. By designing an optimal compensation package, it is conceivable that many of the staffing difficulties reported by hospitals could be alleviated.

Several factors have frequently been suggested as reasons for the growth in supplements to wages throughout the economy. The first relates to preferential treatment of supplements under the existing tax structure. Employer payments for supplements are ordinarily not subject to the personal income tax. To the extent that the personal income tax is progressive, exemptions are of greater value to persons in higher income categories. Moreover, given that marginal tax rates tend to be revised infrequently, the tax advantages of benefits for the family with an "average" income rise with the overall growth in money income. Tax considerations tend to introduce a positive income effect on the quantity of benefits demanded; however, income may not always have a positive impact on the demand for a particular benefit because of offsetting forces operating in the opposite (negative) direction.

At least in one area, health insurance, the tax savings to the employee have been estimated to be substantial. According to the calculations of Feldstein and Allison (1972), the tax saving is often sufficient to make the out-of-pocket cost of the health insurance premium less than the expected value of the benefits. In the absence of tax savings, expected benefits would be less than premiums due to the cost of administering the plan and the insurer's profit.

A second factor relates to scale economies in the provision of many benefits. Large organizations, by making group purchases,

can obtain many types of benefits for far less than they can be purchased on an individual basis. This is certainly the case for various forms of insurance. For example, data presented by MacIntyre (1962) suggest that the gross loading fee (administrative cost plus profit) for individual health insurance policies exceeds that fee for group policies by a factor of 10. According to Dickerson (1959), most health insurers offer explicit discounts as the size of the group increases. Such advantages are unavailable to smaller groups of employers unless they can form larger groups.

Third, it is frequently argued that certain benefits, especially retirement plans that require a long waiting period before the employee's benefit is vested, give employees an inducement to remain with their employers. Since a vested plan yields more value per premium dollar than a nonvested plan, other factors held constant, there is a price incentive for the employee to stay until vested. Specific training provided by employers gives them an incentive to try to retain these employees; and the employees are more likely to stay because such training makes them more productive working for their current employer than for another. An optimal compensation strategy involves paying these employees more than they could earn elsewhere (see Mincer, 1962).

This is the fourth time in this study that we attempt to assess the importance of nonwage benefits to professional nurses. In chapter 3, we employed an hedonic method to determine the value nurses place on specific benefits. According to this approach, judgments about the comparative value of specific nonwage benefits are made from observed compensating wage differentials. If, for example, hospital A is identical to hospital B except that B offers professional nurses inservice education and A does not *and* B pays $X less per month, one may infer nurses are willing to "pay" $X per month for the availability of this benefit. One presumably can make the two hospitals identical in every other respect by using regression analysis. Although the hedonic method's theoretical framework encompasses the employer's choice of specific benefits offered, in empirical applications the presence or absence of a specific benefit is considered of basic nursing school program attended. Older nurses, those with long work histories, married nurses in general, and those married to high earning spouses in particular tend to be immobile. Our analysis of willingness to work in inner-city areas of major metropolitan areas reveals that baccalaureate nurses are more predisposed to work in such areas. Otherwise, type of degree has no independent effect on the nurse's propensity to stay with her current employer.

The presence of children in the household does not prove to be an important factor, a result that would at least superficially seem to contradict results of tabulations in Sloan (1975) on some of the same retention-mobility variables. The results, however, are easily reconciled when one considers that analysis in this chapter is always based on stratified married-unmarried nurse samples, while in the earlier study, children and marital status were not broken down simultaneously. The effects of children evident in *The Geographic Distribution* may be largely attributable to marital status.

The demographic mix of nurse employees is to a large extent beyond the control of the hospital employer. Nor is there much that policymakers can do to directly affect the mix of the nurses in a locality. If nurses with certain background characteristics gravitate to certain kinds of basic nursing programs, it is possible to affect mix in a locality indirectly by varying enrollments in each type of program. However, this is a rather blunt instrument, and the effects of this type policy are only realized in the long run.

While differences were apparent by type of basic nursing program the nurse attended in Sloan (1975) tabulations, such differences, with one important exception, disappear in this chapter's multivariate analysis. This result reinforces the view that the training program per se does not have an impact on nurse attitudes; but there are definite differences in the demographic and socioeconomic characteristics of nurses entering various types of professional training programs, and these characteristics are associated with retention.

As seen in chapter 3, several benefit "packages" had no impact on starting salaries of professional nurses, and others had only small negative impacts. Although this finding would seem to imply nonwage benefits do not matter to professional nurses, there are other explanations. First, the hedonic approach measures importance of nonwage benefits to professional nurses at the beginning of their careers *on the average*. While certain benefits may not be valued by the "typical" nurse, they may be important to groups of nurses. Hospitals may be able to fine-tune their offerings to match particular employee groups' interests if provided with the requisite information. Day care and/or adequate parking facilities in large metropolitan areas are obvious examples. While the empirical research used a starting salary for diplomates as the dependent variable—and presumably this wage reflects preferences of this type of nurse—it is reasonable to question whether wages offered particular groups of nurses are that finely tuned to the wants of their respective

groups. Nurses' wages for various degree-type and experience categories are highly correlated; to the degree that wages are not finely tuned with regard to preferences of nurses in various experience and education groups and all wages reflect preferences of all nurses rather than of particular groups, the hedonic method would reveal preferences of nurses on the whole, not those of a particular nurse category.

Second, there is a possibility that specific nonwage benefits have been poorly measured or, more likely, that important aspects of particular benefits have been missed. For instance, nurses *may* typically consider inservice education to be a waste of time in general, but find discussions of certain topics to be extremely valuable or certain instructors' approaches useful. For these reasons, it is important to replicate inconclusive findings with alternative data sources and methodologies. Hopefully, poor measurement in one case is not necessarily repeated in another.

Ideally, one would conduct surveys sequentially; that is, having obtained inconclusive findings using one line of questioning, one could attempt another. The survey of Hospital Directors of Nursing, used in chapter 3, and the Survey of Registered Nurses, used in chapter 6 and this chapter, were conducted virtually simultaneously. One of the objectives of chapters 5 and 6's analysis was to assess the importance of nonwage benefits as a factor in nurse recruitment and retention. On the whole, the results tend to lend even less support to the importance of nonwage benefits than do those reported in chapter 3. There is, however, a fundamental difference between the approach used in chapter 6 and in this chapter. The former examines nurse demand for nonwage benefits in terms of a particular job action or propensity to take the action, i.e., to leave the nurse's current employer. Here, demand is measured by (1) the nurse's taking advantage of a nonwage benefit when she has the option, or (2) nurse responses regarding willingness to pay for specific nonwage benefits in terms of reduced salary. To my knowledge, this is the first attempt to analyze demand for various employer offerings within the context of a single study in either the health care literature or in more general writings.

The basic hypothesis underlying all empirical work in this chapter is that there is, in fact, substantial variation among different types of nurses in demand for specific nonwage benefits. While the earlier chapters investigated the importance of nonwage benefits to professional nurses as a group, here, by contrast, we examine types of nurses for whom specific benefits may be important. That a benefit is not highly valued on the average but is impor-

tant to a certain type of nurse is a distinct possibility. Given knowledge about which benefits matter to whom, the hospital may be able to operate more effectively in nurse recruitment as well as in retention.

Although the determinants of an optimal compensation package can be conveniently grouped into demand and supply factors, the empirical research in this chapter deals only with demand-side factors. Also, while discussions of wage supplements are often limited to private pension and selected welfare benefits, supplements should be and, for the purpose of this chapter, are defined to include all nonwage benefits, including on-the-job training and working conditions. Finally, research in this area is still in its infancy, and therefore the results of the analysis must be regarded as preliminary.

An Optimal Compensation Package from the Hospital's Standpoint

For analyzing nonwage benefits using any of the approaches mentioned, it is useful to characterize the hospital as a multiproduct organization, producing both patient care services and nonwage benefits, or equivalently, amenities for its employees. The amenities are "sold" to the staff for lower wages; or, in some cases, they are partially financed by direct withholding from the employee's paycheck. An optimal compensation policy embodies both demand and supply influences.

On the demand side is the employee or prospective employee for whom the quantity of a specific benefit demanded depends on several factors, including his income, the benefit's price, and a number of demographic determinants. The employer reacts not to the demand curve for a particular individual but rather to the sum of demand curves corresponding to existing and prospective employees.

The determinants of demand for different nonwage benefits vary, and thus no single model can explain all of them. Some benefits, such as good parking facilities, a pleasant work setting, and, for that matter, vacation, are currently consumed in much the same way as most goods and services are consumed. In such cases, conventional demand analysis is appropriate. Several benefits involve forms of insurance, a second category, for which models of household decisionmaking under uncertainty are appropriate. A third group includes investment type items in which current costs are incurred with the prospect of deferred returns. Included in this category are retirement plans and various forms of training. Holding supply-side factors constant, a given benefit

is more likely to be provided if it is valued by many employees.

Most frequently, demand analysis takes the household as the observational unit; however, this is not advisable in the present context. When more than one household member is employed, it may be desirable for one of them to "specialize" in the procurement of specific benefits. Investment-type fringe benefits provide good examples. If the wife has less attachment to the labor force than the husband, it may make a great deal of sense for the household to rely on the husband's retirement plan; intermittent employment of the wife is likely to mean that a considerable amount of time is spent contributing to nonvested retirement plans. For this same reason, it may be desirable for the wife to concentrate on current consumption, e.g., jobs offering a pleasant work environment, while the husband stresses investment-type options, e.g., "jobs with a future." The fact that husbands and wives systematically select different options *does not necessarily* mean the women are discriminated against; such patterns may also be observed in the absence of discrimination. However, to the extent that women are now participating in the market for longer periods of time, there should increasingly be shifts toward the types of benefits presently desired by prime-age males.

As noted earlier, employers are likely to vary in their efficiency in producing specific nonwage benefits. Variations in this kind of efficiency are among the supply-side factors. Large hospitals may be comparatively efficient in the provision of group life and health insurance, while those affiliated with medical and/or nursing schools may be relatively productive in providing inservice education. Another supply-side factor relates to the price of purchases inputs. Clearly, the price to the hospital of providing adequate parking and/or housing facilities is comparatively high in the central city of a large metropolitan area; in other areas, wages of personnel to staff hospitals' day care centers may be costlier. When a hospital is relatively inefficient in producing a specific nonwage benefit and/or associated input prices are relatively high, the hospital is, holding demand-side factors constant, less likely to provide the benefit. Only if employee demand is high would the benefit be provided, and then at a high explicit or implicit (in the form of reduced wages) price. This conclusion holds under the assumption that hospitals minimize cost, given a particular quantity and quality level. Evidence presented in chapter 2 is certainly consistent with the view that hospitals on the average are cost minimizers in this sense.

These concepts can be formalized in the following way. For purposes of this discussion, it is useful to consider the hospital as producing one product for patients (X) and a number of products

for employees (Q). For purposes of this exposition, it is simpler to consider one Q, Q_1.

Assume the hospital faces a patient demand curve for X and an employee demand curve for benefits provided per employee, Q_1. Furthermore, assume that hospitals maximize cash flow, not utility as in chapter 2, and are wage-takers rather than wage-setters (innocuous assumptions for purposes of this analysis), and that prices of inputs used *exclusively* for production of nonwage benefits do not vary. The hospital selects optimal levels of X, Q_1, L, and N by maximizing ϕ.

$$(7.1) \qquad \phi = P_1(Q_1;E_1)\cdot Q_1\cdot L + P_x(X;E_2)\cdot X - W\cdot L - r\cdot N + \lambda\theta(Q_1\cdot L,X,L,N),$$

where E_1 and E_2 are exogenous variable sets in the two demand functions (the other notation follows chapter 2's). Since Q_1 is defined on a per-employee basis, $Q_1\cdot L$ is the total amount of the nonwage benefit provided. The net wage benefit (s) to an employee is:

$$(7.2) \qquad S = W - P_1(\cdot).$$

The employee pays implicit price (P_1) for the fringe benefit.

The demand function for the benefit plays a potentially important role in the hospital's allocation between nonwage benefits to employees and the provision of services to patients. From the first order conditions of (7.1), it follows that output will be allocated between X and Q_1 according to:

$$(7.3) \qquad \frac{\text{Marginal revenue from } Q_1}{\text{Marginal revenue from X}} = \text{rate of product transformation}$$

between X and Q_1. As the demand for nonwage benefits increases, other factors being equal, marginal revenue from Q_1 rises relative to marginal revenue from X, and the hospital will devote proportionately more of its product to the employee benefit. But at the same time W will fall.

The rate of product transformation gives the amount of X that must be sacrificed to obtain more Q_1 without varying the level of inputs L and N. In this context, staff and nonlabor inputs can be devoted to patient care or to providing nonwage benefits to the staff, such as providing training programs for personnel, operating parking facilities, providing housing for personnel, and administering health insurance programs. If the amount of X that must be sacrificed (from a given level of L and N) to obtain an additional unit of Q_1 is very high, the amount of Q_1 that will be provided, again holding other factors constant, will be low. Referring to (7.3), a substantial sacrifice implies a high rate of product transformation. For the equality to hold, the left hand side of (7.3) must be high as well. Since marginal revenue from Q_1

varies negatively with the level of Q_1, holding other factors constant, the fraction on the left side is higher for lower levels of Q_1. One infers that less of Q_1 will be provided if it takes a lot of resources to produce the marginal unit.

It follows that if the rate of product transformation is quite high and/or marginal revenue from Q_1 (at any positive level of Q_1) is low, it is likely that no units of the benefit will be provided. Intuitively, this means that if the nonwage benefit uses a lot of the hospital's resources in the process of providing it, and/or employees do not care much about the specific nonwage benefit, the hospital will find it optimal not to offer the benefit. Only after sources of variation on the supply side have been assessed will it be possible to fully understand specifically which—and under what circumstances—nonwage benefits should be provided by hospitals (according to their own self-interest).

Conceptual and Empirical Evidence on Demand for Specific Nonwage Benefits

In this section, equations depicting the demand for specific benefits are specified, and empirical results based on data from the Survey of Registered Nurses are presented. As already noted, demand is only one element in determining the types and levels of benefit offerings. Also important is the efficiency of the employer in producing various kinds of benefits, as well as the input prices employers pay.

This analysis must be viewed as explanatory for several reasons. First, the literature on which to base equation specification is quite sparse. Surprisingly few studies use formal methods to analyze determinants of fringe benefits.[1] In view of the recent growth in the importance of nonwage compensation, this lack of evidence is unfortunate.

Second, the required information has proved to be extremely difficult to obtain. Although the Survey of Registered Nurses included a substantial number of questions on a range of benefits, the accuracy of nurse responses to these questions is frequently lower than it is to other portions of the survey instrument.

Two types of questions are pertinent to demand for nonwage benefits. One relates to whether the nurse took advantage of the benefit when she had the option. She would not have the option if: (1) the benefit is provided by the hospital on a compulsory

[1] Opinion surveys requesting persons to list preferences for specific fringe benefits are more common. One of the more informative articles of this type is Wagner and Bakerman (1960). Kolodrubetz (1975) provides a general review of fringe benefit coverage trends. Two relevant articles by economists that provide some conceptual material are Lester (1967), and Mabry (1973).

basis; (2) if it is fully subsidized by the employer; or (3) the benefit is not provided. A second type of question ascertains the amount the nurse would be willing to pay in terms of change in salary to receive a specific benefit. In contrast to the first, this type involves hypothetical questioning. In some cases, the survey question stated, "Below are hypothetical offers, an increase in a fringe benefit versus an increase in salary. Indicate on the right-hand side the raise in your salary you regard as equivalent to the new fringe. If the fringe is worthless to you, write '0' after the $ sign." In others, the question was, "Say the hospital wanted to eliminate the following (benefits), how much would you want in the form of a salary increase to be compensated for the loss of the item? If it is worthless to you, write '0' after the $ sign. (Check if the item is not available or not applicable.)"

Although responses to the willingness-to-pay questions were presented in the form of tabulations in *The Geographic Distribution* (Sloan, 1975), further investigation revealed too many inconsistencies in the dollar responses to permit these data to be used in multivariate analysis. For example, some respondents apparently gave dollar amounts in terms of their annual salaries rather than their monthly salary as the question requested; but there really is no way to be sure that is the case. While "outliers" are weighted equally in calculating the means presented in the tables, they receive disproportionate weight in regression analysis. In fact, as is well known, a few outliers can alter the resulting parameter estimates markedly. Rather than develop complicated algorithms for screening the data, when willingness-to-pay data are used, the dependent variable, with one exception, is binary. This variable is 1 if the respondent is willing to sacrifice some salary for the benefit, and zero if she is not.

The consequence of this decision can be seen with reference to figure 3. The willingness-to-pay questions fix the quantity of a given benefit at a point such as "A" in the figure. Examples of the ways in which the quantities are fixed are "An additional week of sick leave"; and "Additional $100 per month of retirement benefits at age 65. You pay nothing." Then the respondent is asked to state the amount she would be willing to pay for this quantity of benefit. Presumably (and hopefully) the responses reflect the maximum one would pay, since only then do these answers have meaning. It is plausible to expect that many respondents are not willing to pay anything for a given benefit. Such responses coincide with the quantity axis at point "B"; others will be willing to pay more—points "C" through "F."

The reason one expects a concentration of observations at

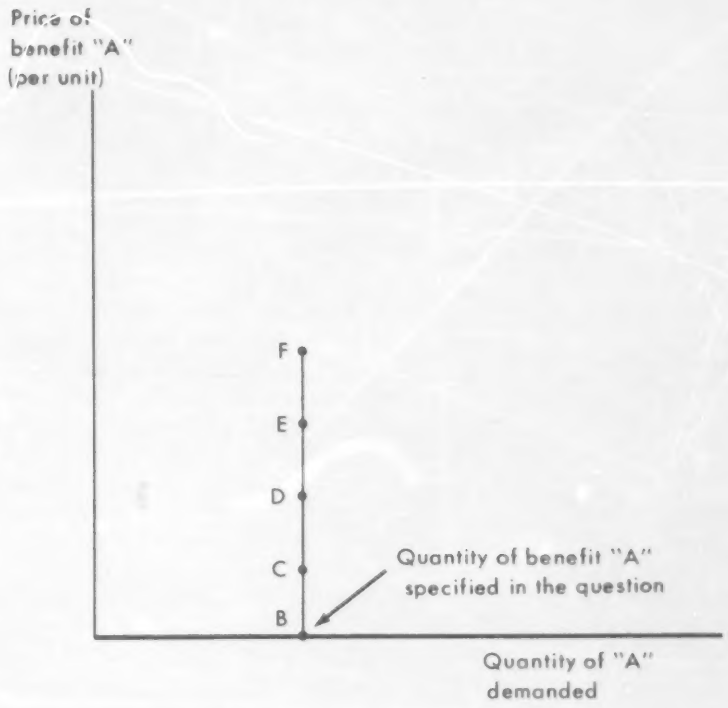

Figure 3.—Demand for benefit "A."

point "B" is that many benefits may be worthless to the respondent, and such benefits cannot generally be traded. If someone were, for instance, given a refrigerator, there is a used market for such items; the value to the respondent would then at least be the value of the item in resale minus an imputed cost to account for the time and trouble involved in making the transaction. Unless the transactions costs are high and the resale value low, there should be few if any zero values. However, benefits of the type offered by employers cannot be exchanged for money (or equivalently, other goods) in this manner. The nurse cannot sell her rights to group health insurance, nor her rights to an inservice education program. Therefore, a considerable amount of information is revealed by an analysis that distinguishes between zero and nonzero responses, although a continuous measure would have been preferable if the latter were accurate.

A third reason for viewing this analysis as exploratory stems from the nature of the sample. The Survey of Registered Nurses only included responses from nurses employed by hospitals. Particularly important among the nurses who are excluded are those

not currently employed. Potential consequences of using employed persons only (or labor force participants only) in the sample will be assessed in chapter 8. In brief, however, unless a rather stringent set of assumptions can be shown to hold, it is not valid to generalize the results based on an employed sample of nurses to all nurses. Given that the availability of certain nonwage benefits to employees differs systematically according to whether the nurse is employed on a full- as opposed to a part-time basis, the empirical analysis presented in this section is, with one exception (noted below), restricted to full-time, female, staff professional nurses. Generalizations obtainable from this analysis therefore only apply to this group of nurses.

Since the dependent variable is binary, it is appropriate to use a technique specifically developed for these situations. Logit analysis (appendix D), one of these techniques, is employed in the analysis that follows. The computer program used for the logit analysis allows t-statistics to be calculated when there are only two groups, as is the case throughout this chapter; thus t-statistics are included in the tables that follow. Also, unlike the preceding chapters in which the logit technique was used, chapter 7 does not present separate tables with predicted probabilities. Rather, selected probabilities are mentioned as part of the discussion of particular variables. To present separate tables on predicted probabilities in this chapter would result in an unmanageable number of tables.

Not all of the nonwage benefits covered by the Survey of Registered Nurses will be included in the analysis. Some benefits were eliminated in preliminary empirical analysis when it became apparent that internurse variation in demand could not be adequately explained by variables derived from the survey. In order of presentation, this section discusses demand for (1) health insurance, (2) life insurance, (3) retirement benefits, (4) on-the-job training and professional advancement, (5) maternity leave and day care, and (6) adequate parking facilities.

Demand for Health Insurance

Unlike other nonwage benefits, there has been a substantial amount of conceptual and empirical research on determinants of demand for health insurance (in particular, Feldstein, 1973; Frech, 1975, and Phelps 1973, 1976). Using prior research as a guide, the quantity of group health insurance demanded is specified to be a function of: the price of insurance, attitudes toward risk, expected use of health services, tax advantages, the availability of health insurance from other sources, and special options—coverage of the employee's family and the option to

convert to an individual plan once the employee terminates. The dependent variable reveals whether or not the nurse has in fact enrolled in the hospital's health insurance plan when she has had this option. Nurses working in hospitals without plans or in hospitals with compulsory plans have been eliminated from this analysis. The Survey of Registered Nurses also asked the nurse to state the amount she would want in the form of a monthly salary increase if all health insurance benefits were removed. Regressions estimated at an early stage in the research, however, failed to produce reasonable results. Regressions based on the latter dependent variable thus will not be reported here.

In the context of insurance, price is the difference between the premium and the benefit expenditures, i.e., the "loading." There is evidence that the loading varies negatively with the size of the employee group. In this sense, hospital size, gauged in terms of the number of beds set up and staffed, is one measure of price. Since this is an analysis of employee demand, one must also account for the hospital's subsidy. A binary variable indicative of whether or not the hospital subsidizes group health insurance is included as a second price variable.

The basic rationale for insurance is a hedge against risk. While the loading (except in an "idealized" world of zero administrative costs and profits) is always positive, people are generally willing to pay the loading in return for insurance against a high income loss. For given probability distribution of possible income losses, higher income families are probably more willing to assume risk, that is, to self-insure. In this sense, income tends to reduce the demand for insurance of all types.

Numerous studies have documented sources of variation in the use of health services. Among these sources are age (of the employee), number and ages of children, and family income. If premiums varied with the individual's expected use, use per se would not be a factor. But group premiums reflect the experience of the group, not the individual. This gives the comparatively unhealthy an incentive to join and the comparatively healthy a disincentive to do so. Although income may tend to reduce the aversion to risk, it increases expected use. Tax advantages of in-kind benefits are greater for high income families. This factor tends to reinforce any positive influence income might have because of the need factor. But since there are offsetting factors of these types, the net effect of income on the quantity of health insurance demanded is unknown *a priori*.

In a complete model of family health insurance demand, coverage from all sources, both employment related and nonemployment related, might be considered to be jointly determined. But

since husbands tend on the average to be employed on a more continuous basis than do wives, a case can be made for considering the family's coverage through the husband's place of employment to be predetermined. As a first approximation, it is reasonable to take the latter course, particularly since the requisite data for a complete specification of a system of health insurance demand equations are unavailable. In this study, measures of spouse health insurance coverage are binary variables indicating (1) whether the spouse is eligible for health insurance through his employer (probably an exogenous variable in any case); and (2) whether members other than the spouse are covered by the spouse's plan. Both variables, as defined, should have negative influences on the nurse's demand for health insurance through her place of employment.

Finally, binary variables signifying whether the nurse's hospital offers a family plan option and whether the hospital's group insurance can be converted to an individual policy upon termination are expected to have a positive impact on the nurse's demand for health insurance.

Empirical results are presented in table 28. As in most of the tables that follow, results are presented separately for married and unmarried (single, widowed, separated, and divorced) nurses. Stratification on the basis on marital status permits a more exact specification of variables referring to the nurse's spouse.

As table 28 indicates, there are substantial differences in the proportions of nurses accepting health insurance option as a function of marital status. While only 73 percent of married nurses reported taking the option, 93 percent of the unmarried nurses did so. Since unmarried nurse participation in the hospital's health insurance plan is nearly universal, determinants of variation in participation on the part of married nurses merits far greater attention in this discussion.

Using statistical significance as the criterion, the subsidization variable demonstrates the clearest impact on the demand for health insurance. Coefficients associated with the number of beds in the hospital variable are positive as expected, but insignificant at conventional levels. Unfortunately, data on the proportion of the premium covered by the hospital are unavailable. While it is not possible to calculate the elasticity of demand with respect to the *proportion* of the premium subsidized, it is clear that demand for insurance is responsive to premium subsidization. Assuming mean values for age, income, and hospital beds, and assuming that the hospital's plan has family and conversion options and that the spouse has a plan with coverage for other

Table 28.—Demand for health insurance: Nurse takes health insurance when she has option

Explanatory variables	Married		Unmarried	
	$\log_e(P_1/P_2)$	t	$\log_e(P_1/P_2)$	t
Constant	−0.154E 01	–	−0.134E 01	–
Nurse's age	0.719E-02	0.81	0.121E-01	0.71
Number of nurse's children under age 7	0.022E-01	0.02	−0.711E 00	[1] 2.28
Number of nurse's children age 7 to 18	0.256E-01	0.37	−0.314E 00	1.68
Nurse's annual earnings	0.329E-03	[2] 5.54	0.172E-03	1.63
Spouse's annual earnings	−0.450E-04	[2] 2.74	–	–
Household's annual nonemployment income	0.353E-04	0.48	−0.221E-03	1.95
Spouse eligible for health insurance through his employer	0.716E 00	2.31	–	–
Other members of family covered by spouse's plan	−0.171E.01	[2] 5.84	–	–
Number of beds in nurse's hospital	0.533E-03	1.44	0.581E-03	0.83
Nurse's hospital insurance has family plan option	−0.502E 00	1.28	0.644E 00	0.94
Nurse's hospital pays all or part of premium	0.153E 01	[2] 7.81	0.244E-01	[2] 7.07
Nurse's hospital's plan can be converted to individual plan after nurse terminates	−0.424E 00	1.56	0.240E 01	0.00
	R^2=0.24		R^2=0.33	
	χ^2 = [2] 169.02(12 d.f.)		χ^2 = [2] 78.85(9 d.f.)	
	[3] $\bar{P}_1$=0.73		$\bar{P}_1$=0.93	

[1] Means significant at the 5-percent level.
[2] Means significant at the 1-percent level.
[3] Proportion taking the option.

family members, the predicted probability that a nurse will take advantage of the option rises from 0.41 without subsidization to 0.88 with it.

The anticipated positive impacts of nurse age and the number of children were not found. These results are counter to findings of previous studies (for example, Feldstein, 1973; and Phelps, 1973).

Family income is divided into three components, annual earnings of the nurse and of her spouse and, nonemployment income. The spouse earnings coefficient is negative, probably reflecting better coverage by the spouse's employer when the spouse's earnings are comparatively high. But the positive nurse earnings coefficient is over seven times higher than the spouse's in absolute value. Family income's positive net impact suggests that expected use and tax considerations dominate any potential risk aversion effect associated with this variable.

Family coverage at the spouse's place of employment exerts a statistically significant, negative effect on nurse demand for health insurance. The coefficient of the other availability measure, spouse eligibility for health insurance through his employer, is positive and significant at the 5-percent level. However, the latter coefficient is much smaller in absolute value than the former. Viewing the two coefficients jointly, as is generally appropriate, the effect of availability from this alternative source is negative. Assuming mean values for the age, income, and hospital beds variables, and no hospital subsidization, coverage of the family by the spouse's plan reduces the probability of the nurse taking advantage of the option from 0.61 to 0.41.

Finally, a hospital's provision of family coverage and conversion to an individual policy upon termination appears to make essentially no difference to nurses.

Demand for Life Insurance

Determinants of demand for life insurance are essentially the same as for health insurance. Price, risk preferences, tax considerations (which are even more important since life insurance may provide a ready source of cash for paying the estate tax), and such attributes of the plan as convertibility are all factors. Availability of group life insurance from other sources is probably a determinant as well, but unfortunately data are not available on this variable for life insurance. Expected use plays a similar role in that the relatively unhealthy tend to have a lower life expectancy; and group life insurance policies frequently do not take individual variations in life expectancy into account. However, unlike health insurance where the only adjustment for

health status is sometimes to exclude preexisting health conditions during the initial employment period, life insurance frequently charges premiums that vary with employee age.

Theoretically, a major difference between health and life insurance is the potential importance of the bequest motive in the case of life insurance. The value of life insurance to the insured lies exclusively in the income protection of other family members and/or nonfamily beneficiaries. The presence of children and other adult dependents in the household and family income should account for variations in the strength of the bequest motive.

Tables 29 and 30 present empirical findings on demand for life insurance. The regressions in table 29 examine circumstances under which the nurse takes out life insurance through her hospital employer when she has the option; the criteria used are the same as those for health insurance. The regression in the second table uses responses to the following attitudinal question as the dependent variable: "Below are hypothetical offers, an increase in a fringe benefit versus an increase in salary. Indicate . . . the raise in your salary you regard as equivalent to the new fringe. If the fringe is worthless to you, write '0' after the $ sign. . . ." In this instance, the fringe is "additional term insurance on your life with death benefit of $25,000. Hospital pays the entire premium." The dependent variable assumes the value 1 if the nurse gave a positive dollar amount and is zero otherwise.

The results based on the more objective life insurance information are far superior to those based on the attitudinal information, using both goodness-of-fit and plausibility of results as criteria. Table 30 is included to contrast results based on the two kinds of information. Table 29's results are assessed first.

As with health insurance, the most statistically significant coefficients relate to hospital subsidization of group life insurance. Also, the coefficients relating to the number of hospital beds are positive, as expected, and statistically significant at the 1-percent level. Analyzing predicted probabilities with nurse age, income variables, and hospital beds evaluated at their means and the conversion option set at 1, the probability that a married nurse will take advantage of the life insurance option rises from 0.48 without subsidization to 0.76 with it. Subsidization has even a stronger impact on unmarried nurses, although, in absolute terms, the unmarried nurse is unlikely to take advantage of the option to insure her life in either case.

The age parameter estimates are substantially larger than those in table 28 and have higher associated t-values; yet, they are insignificant at conventional levels. The positive age effect

Table 29.—Demand for life insurance: Nurse takes life insurance when she has option

Explanatory variables	Married		Unmarried	
	$\log_e(P_1/P_2)$	t	$\log_e(P_1/P_2)$	t
Constant	−0.483E 01	–	0.687E 00	–
Nurse's age	0.283E-01	1.48	0.340E-01	1.68
Number of nurse's children under age 7	0.146E 00	0.60	0.381E 00	0.91
Number of nurse's children age 7 to 18	−0.791E-01	0.54	0.483E 00	1.83
Number of nurse's children over age 18 living at home or receiving financial support from nurse	0.550E-01	0.02	−0.151E 00	0.44
Number of adult dependents	0.298E 00	0.00	−0.357E 00	0.39
Nurse's annual earnings	0.357E-03	[1] 2.96	−0.344E-03	[2] 2.35
Spouse's annual earnings	−0.790E-05	0.24	–	–
Household's annual nonemployment income	0.573E-03	[2] 2.30	−0.637E-05	0.00
Number of beds in nurse's hospital	0.410E-0	0.82	0.661E-03	1.85
Nurse's hospital pays all or part of the premium	0.126E 01	[1] 3.54	0.152E 01	[1] 3.74
Nurse's hospital's plan can be converted to individual plan after nurse terminates	0.295E 00	0.69	0.262E 00	0.51
	$R^2=0.24$		$R^2=0.08$	
	$\chi^2=$ [1] 38.59(11 d.f.)		$\chi^2=$ [1] 31.14(10 d.f.)	
	[3] $\bar{P}_1=0.63$		$\bar{P}_1=0.56$	

[1] Means significant at the 1-percent level.
[2] Means significant at the 5-percent level.
[3] Proportion taking the option.

Table 30.—Demand for additional life insurance

Explanatory variables	Married	
	$\log_e(P_1/P_2)$	t
Constant	0.422E 00	–
Nurse's age	0.679E–02	1.91
Number of nurse's children under age 7	0.260E 00	1.56
Number of nurse's children age 7 to 18	0.127E 00	0.36
Number of nurse's children over age 18 living at home or receiving financial support from nurse	0.429E–01	0.49
Number of adult dependents	–0.154E 00	0.14
Nurse's annual earnings	0.741E–05	0.02
Spouse's annual earnings	–0.464E–04	[1] 2.43
Household's annual nonemployment income	–0.188E–03	[1] 2.20
Nurse already has policy with hospital paying over $30,000 at death	–0.212E–04	1.09
	R^2=0.05	
	χ^2=18.32(9 d.f.)	
	[2] $\bar{P}_1$=0.56	

[1] Means significant at the 5-percent level.
[2] Proportion willing to pay for additional life insurance.

probably in part reflects the practice of some hospitals not to vary premiums according to age. It may also be indicative of problems some older nurses find in obtaining individual life insurance at any price. None of the children or adult dependents variables demonstrate any impact.

As judged by predicted probabilities (not shown), the effect of total family income on the demand for life insurance is clearly positive for married nurses, although, as with health insurance, the coefficient on the spouse earnings variable is negative. Also, again, whether or not the convertibility option is offered appears to be unimportant to nurses.

These conclusions follow from table 29. Tables 29 and 30 reveal important differences. According to table 30, nurses with life insurance paying death benefits of $30,000 or more tend to be less interested in obtaining additional group life insurance. The age parameter estimate is nearly significant at the 5-percent level, but the implied impact of age on the predicted probabilities is small. Taking the income variables at their means, an increase in nurse age from 22 to 52 only increases the probability that the nurse is willing to pay for more life insurance by 0.04. Total family income's effect in table 30 is clearly negative, a result not necessarily inconsistent with the positive effect observed for married nurses. Since most nurses have some life insurance through their hospital employers, the decision represented in table 30 most often involves whether the nurse desires to pay for more life insurance than she already has through the hospital. Nurses may not wish so much life insurance protection.[2]

Demand for Retirement Benefits

Retirement plans represent one form of personal saving. By placing funds in such a plan, the household effectively transfers consumption from the present to a later date. Such plans offer definite advantages in that income from the plans is taxed at the time it is realized rather than currently. Tax deferral may create a substantial tax savings, particularly if the time period during which the income is to be realized is far off. Demand for retirement benefits are dependent on the expected pecuniary return to household from such plans, the dollar amount the household has in retirement plans available from other sources including social security, income-earnings influences, and the household's asset preferences.

[2] Although a great deal has been written on life insurance, empirical evidence on the demand for life insurance per se is meager. To my knowledge, the only estimates of the effect of family income on life insurance demand are in Rice (1966), which are in turn based on Friend and Jones (1960) and Miner (1957). Rice maintained that income elasticities of demand for life income are close to unity. Tables 29 and 30 demonstrate too much variation in income's impact to permit a generalization of this sort.

The expected return is a function of several factors. Probably most important, the return from an employer-sponsored plan depends on the likelihood of receiving benefits, which in turn reflects the plan's vesting provisions and the employee's likelihood of staying with the employer. Also relevant is the plan's management, at least to some extent now controlled by law, and the types of securities used to generate plan income. The tax deferral feature tends to increase the return on retirement plans relative to other forms of investment; however, tax deferral is more advantageous to households in higher income groups.

The potential effects of *other* retirement programs available to the nurse, including social security, on nurse demand for retirement benefits through her employer are also complex. Katona (1965) and Cagan (1965) reported that persons covered by private pension plans do not tend to save less and may even be more prone to save than persons not covered by such plans. Since a pension plan from the nurse's hospital is a form of saving, this would suggest that availability of plans from other sources would augment rather than decrease nurse demand for pensions through their hospital employers. Cagan suggested that the provision of a pension plan may itself be responsible for a "recognition effect." That is, personal contact with the plan forces the individual to recognize that he/she must plan for retirement. Katona accounted for this behavior in a somewhat different way. He employed the "goal gradient" hypothesis according to which people intensify their efforts the closer they get to realizing their goals. As applied to this context, the hypothesis suggests that as one accumulates a certain amount of funds for retirement and comes reasonably close to a goal, there is a special incentive to accumulate more to reach the goal. Someone who is far from the goal, by contrast, has less incentive to even try to reach it.

Feldstein (1974) and Munnell (1974, 1976) have offered an alternative explanation of the observed pattern, one that does not rely on an ad hoc assumption of preferences changing as a consequence of an exogenous retirement plan. These authors reasoned that pensions give the covered employee an incentive to retire early. The imposed pension has two impacts: First, it tends to reduce other forms of saving, including the demand for additional pensions, because the pension plan is a substitute for other forms of assets; and second, it increases other forms of saving because, on the average at least, the expected period of retirement tends to lengthen. Thus, the net effect of availability of pension plans is indeterminate in advance. Empirical evidence in the Feldstein and Munnell studies, however, showed that social security depresses other forms of personal saving substantially.

Considering the expected length of retirement to be endogenous in this context also has implications for earnings and income variables. Nurse earnings embody both substitution and income effects. According to the substitution effect, the nurse with high earnings is expected to retire later. The income effect has the opposite implication. Retirement is a form of leisure, and high earnings allow the nurse to accumulate funds necessary to "purchase" it. Spouse earnings may also be divided into (cross-) substitution and income-effect components. As spouse earning potential rises, the household has an increasingly greater incentive to rely more heavily on spouse employment, allowing the nurse to retire earlier. On the other hand, the income effect leads to earlier spouse retirement, which, because of custom, probably means the nurse will retire earlier as well. The family's nonemployment income is only responsible for an income effect; that is, higher nonemployment income means earlier nurse retirement.

Early nurse retirement also lowers the probability the nurse will stay until her retirement benefits through the hospital are fully vested. In this sense, early retirement is two-edged. It raises the demand for accumulated assets of all types; but at the same time, it may limit the usefulness of asset accumulation through current employment.

Finally, the household's portfolio reflects its attitude toward risk. It is often said older persons are more adverse to risky investments. Since, except for the vesting consideration, retirement plans are relatively riskless forms of asset accumulation, it is likely nurse age has a positive impact on nurse demand for retirement benefits.

The Survey of Registered Nurses requested information on nurse participation in hospital retirement plans and on the dollar amount of salary increase the nurse regards as equivalent to an "(additional) $100 per month of retirement benefits at age 65. You (the nurse respondent) pay nothing." Although responses to willingness-to-pay questions are generally less accurate indications of the demand for specific nonwage benefits, only this type of question may be used for the analysis of nurse demand for retirement benefits, since very few hospitals offering a plan give the nurse the option to participate. According to the Survey of Hospital Directors of Nursing, only 11 percent of hospitals with a retirement plan for professional nurses had a noncompulsory plan.

Table 31 presents results of the analysis of demand for retirement benefits. The dependent variable assumes the value 1 if the nurse is willing to pay some amount for the benefit and is zero otherwise.

Table 31.—Demand for additional retirement benefits

Explanatory variables	Married $\log_e (P_1/P_2)$	t	Unmarried $\log_e (P_1/P_2)$	t
Constant	0.346E 00	—	−0.767E−00	—
Nurse's age	0.173E−01	1.80	0.473E−01	[1] 3.63
Number of years nurse with present employer	0.722E−01	[1] 2.80	−0.392E−01	1.40
Number of years nurse expects to stay with present employer	0.888E−02	1.67	0.124E−01	1.75
Nurse now enrolled in retirement plan through hospital	0.142E 00	0.87	0.299E 00	1.46
Spouse now enrolled in retirement plan through employer	0.979E−01	0.60	—	—
Nurse pays social security	−0.310E−01	0.10	0.323E 00	1.27
Spouse pays social security	−0.249E−01	0.14	—	—
Nurse's annual earnings	−0.331E−04	0.66	−0.389E−04	0.64
Spouse's annual earnings	−0.360E−04	[2] 2.53	—	—
Household's nonemployment income	−0.465E−04	0.66	0.333E−04	0.28
	R^2=0.05		R^2=0.07	
	χ^2 =[1] 31.15(10 d.f.)		χ^2 =[1] 27.47(7 d.f.)	
	[3] $\bar{P}_1$=0.66		$\bar{P}^1$=0.68	

[1] Means significant at the 1-percent level.
[2] Means significant at the 5-percent level.
[3] Proportion willing to pay for additional retirement benefits.

These are the principal findings: First, the number of years the nurse expects to stay with her present employer exerts, as anticipated, a positive effect on nurse demand for additional retirement benefits, which is almost significant at the 5-percent level in the case of both married and unmarried nurses.

Second, the impact of spouse earnings on demand is clearly negative. As stated earlier, both substitution and income effects associated with spouse earnings imply earlier retirement for the nurse. Since retirement is presumably held constant in this regression by the expected stay with current employer variable, one should look to other reasons for the spouse earnings effect. Tax considerations would imply a positive not a negative impact. Declining risk aversion as a function of income would imply a negative impact; the relatively affluent may want to invest in more risky assets offering a high return. High spouse earnings may also coincide with more comprehensive retirement plans available to the household through the spouse's employer. But the other measures of availability of retirement plans in the regression do not point in the same direction; with the exception of "number of years nurse with present employer," which should reflect the value of assets the nurse has accumulated in other employment-related retirement plans, none of the availability variables is statistically significant; and, even in this instance, there is an unanticipated negative sign in the case of the unmarried nurses.

Third, the nurse age coefficient is positive with a t-value of 3.6 in the unmarried regression, and is positive and almost significant at the 5-percent level in the married nurse regression. Underlying this relationship are probable differences in asset preferences that vary systematically by nurse age.

Demand for On-the-Job Training and Professional Advancement

Jobs vary in the amount of opportunities they offer for learning as a by-product of the work experience. As is true of other types of benefits, providing opportunities for learning and acquisition of skills generally requires resources that could be used by the employer for other activities.

Training acquired on the job falls into two categories, general and specific. General training increases the employee's productivity in several competing employments. In the context of nursing, inservice education programs most frequently provide general training. Specific training by contrast increases the worker's productivity in a particular setting without necessarily enhancing the employee's productivity in alternative employ-

ments. Probably the best example of specific training in the context of hospital-based nursing are orientation programs for new employees.[3]

Since general training increases the employee's productivity in several employment settings, it has been argued returns to such training accrue to the employee rather than the employer. After all, the employee could receive such training in one setting, then move to another where he/she can command a higher wage. It follows, therefore, the employee should pay the entire cost, most often in the form of lower wages at the time general training is received. This, of course, would not be true in a situation of employee immobility but in such situations, there is no difference between general training and specific training.

Although the employee cannot obtain a higher wage elsewhere as a consequence of specific training, it may nevertheless be optimal from the employer's vantage point to raise the wage of the recipient of specific training somewhat above that which he/she could earn elsewhere. Since losing personnel with specific training involves costs to the employer, he can lower his labor costs by providing an incentive for these employees to stay. The amount of the wage premium reflects both hiring and specific training costs.[4]

In this chapter, interest centers on nonwage benefits accruing to employees; thus, the analysis deals with general rather than specific training. As with other benefits considered here, hospitals may be able to provide certain forms of general training more efficiently than other organizations. For example, some hospitals may be better able to offer a course in specific aspects of psychiatric nursing than would a free-standing, for-profit firm giving night courses on the subject.

Rosen (1972) has developed a model in which there are a number of different types of jobs for persons in a given occupation. The jobs are assumed to differ only in the extent to which they offer employees general training. At different steps in the life cycle, varying amounts of training are desired. To obtain different amounts of training, the employee must change jobs; and the employee "pays" for such training by accepting reduced wages. The amount of general training offered is a result of an optimization process of the type presented in the previous sec-

[3] There is a slight problem with this example. Nurses often complain that the hospital's orientation program provides insufficient guidance for the newly employed nurse. According to the specific training notion as developed by economists, the employer is the primary beneficiary of returns to specific training rather than the employee. The RNs' complaints may reflect the fact that nursing is a profession and the RN has a legitimate concern for the care she renders. Professional interests per se have not been incorporated into standard training models.

[4] See Becker (1964), Mincer (1962), Oi (1962), and Pencavel (1972).

tion. Firms located in market areas where employees demand a great deal of training (for example, in areas where the workers tend to be young) will, holding other factors constant, find it optimal to provide more general training. Firms also differ in their efficiency in "producing" training; the more efficient ones, other factors being equal, are more likely to provide greater amounts of it.

In Rosen's model, the provision of general training is inextricably connected to the job. The fact that the vast majority of nurses begin their careers in hospitals, where general training is more likely to be provided, does suggest a type of movement from more general training-oriented jobs initially to less training-oriented jobs later in a nurse's career of the type Rosen describes. But nurses also have options to take advantage of specific educational offerings once on the job. Such offerings involve extra commitment from the nurse—such as additional time away from the household and possibly the expense of carfare if these courses and seminars are given in a location other than the nurse's normal work setting. The fact that such options exist does not prove Rosen wrong, since his is an assumption for purposes of analytical convenience.

Models of demand for general training contain the following variables categories: Age and expected retirement are factors, since the individual with a greater number of expected work years is likely to derive a benefit from such training over a longer time period. Natural ability and previous education potentially affect the gain in knowledge realized from a "unit" of training. Education is important to the extent that persons with higher educational attainment may be able to absorb new material more rapidly and satisfactorily. Finally, wages of labor with the skills provided by the training affect the returns from training. On the cost side, the individual will be sensitive to the price per unit of training, where price includes the value of foregone earnings, of time spent away from the household, and of various out-of-pocket costs, such as carfare, books, and the like.

Data from the Survey of Registered Nurses permit a *very preliminary* examination of this important topic. Two questions are particularly pertinent: First, "Does your hospital give release time with pay to participate in workshops, conferences, courses, etc?" and "If yes, have you ever taken advantage of this?" Second, a willingness-to-pay question asked the nurse respondent to state the dollar amount she would have to be paid in additional monthly salary if all opportunities for professional advancement with her present employer were removed. "Professional advancement" encompasses opportunity to acquire general train-

ing on the job, as that term has been used here. In addition, professional advancement may mean promotion to a nursing position above the staff nurse level; but, presumably, it does not mean attaining a higher administrative position with very little or no nursing content.

Table 32 presents results on the demand for release time to attend workshops, conferences, and courses. The dependent variable is one if the nurse has had this option with her present hospital employer and has taken advantage of it. If she has had the option, but has not taken advantage of it, the dependent variable is zero. In this case, married and unmarried nurse observations are combined in a single regression.

That "the number of years the nurse has been with her current employer" is positive and significant at the 1-percent level is more or less an artifact of the way the dependent variable has been defined. Certainly, employees who have been at the hospital for a longer period of time are more likely to have participated in this program at one time or another.

The regression contains several measures of educational attainment. Although the type of basic nursing degree appears to be an unimportant demand determinant, some graduate work and work in a nursing specialty do influence the demand for this type of on-the-job training. Using the framework discussed earlier, these results imply that professional nurses with the highest amounts of formal training are more "productive" in utilizing information obtainable from this kind of training situation.

Two proxies for the potential quality of these inservice education programs are included in the regression. To the extent larger hospitals are more efficient in producing such training, they may provide more comprehensive programs. If so, a positive impact of hospital size on demand for release time should be observed. However, a negative coefficient is observed. A second measure distinguishes hospitals that specifically budget for inservice education programs from those that do not. Presumably when such programs have a line item in the budget, they are offered on a more regular basis and may be more comprehensive. However, as with hospital size, a negative rather than the anticipated positive sign is observed.

Since workshops, conferences, and courses are more likely to be given in the daytime, nurses working evenings and nights will have to extend, on the average, greater effort to attend them, even if compensatory release time is granted by the hospital. The two variables "nurse works evening or night shift" and "nurse changes shifts" are both significant at better than the 1-percent level with the anticipated negative signs.

Table 32.—Demand for release time for workshops, conferences, and courses

Explanatory variables	Married and unmarried	
	$\log_e(P_1/P_2)$	t
Constant	0.416E 00	—
Nurse has AA degree	0.559E–01	0.36
Nurse has BA degree	−0.195E 00	1.13
Nurse has studied at the graduate level	0.131E 01	3.03
Nurse's age	0.407E–02	0.63
Nurse qualified and working in a specialty	0.561E 00	[1] 4.68
Number of years nurse with current employer	0.126E 00	[1] 5.77
Number of beds in nurse's hospital	−0.273E–03	1.74
Nurse works evening or night shift	−0.614E 00	4.38
Nurse changes shifts	−0.403E 00	[1] 2.80
Nurse's hospital specifically budgets for insurance education	−0.115E 00	0.79
	R^2=0.12	
	χ^2 = [1] 140.09	
	[2] $\bar{P}_1$ =0.63	

[1] Statistically significant at the 1-percent level.
[2] Proportion taking advantage of option

Although positive, the nurse coefficient is insignificant, a surprising result. All demand-for-training models emphasize the importance of employee age, on the assumption that the bulk of training tends to be acquired during a person's earlier years.

Table 33 contains regressions developed to analyze nurse demand for professional advancement. Like other regressions based on willingness-to-pay questions, the dependent variable is 1 if the nurse would require a raise for loss of all professional advancement opportunities; otherwise, the dependent variable is zero. In table 32, income variables were not included, and thus the specification for married and unmarried nurses was identical. In table 33, it is necessary to distinguish between the two groups because a spouse earnings variable is included.

With a measure of the nurse's expected stay with the current employer as a separate explanatory variable, earnings-income variables do not represent the role of expected stay on demand. To the extent on-the-job learning is an investment, income has no role, except for the influence it has on labor force participation (and, in formal education contexts, on access to funds for educational investments). However, on-the-job training may also yield consumption benefits to the extent that persons enjoy the learning process itself and/or feel personally enriched by the knowledge gained thereby. Assuming, as is plausible, that demand for these consumption aspects is positively related to income, one would expect income to have a positive impact when demand for various types of training programs are dependent variables. The anticipated positive effect, however, is not observed in table 33, possibly because "professional advancement" has been construed by nurse respondents to encompass more than training.

In most other respects, the results presented in table 33 are disappointing. Many of the significant effects shown in table 32, such as the one between nurse education and demand for training, are not evident in this table. An important exception is nurse age, which has the anticipated negative coefficient in both regressions, with associated t-values in excess of 5.0. Evaluating predicted probabilities of the means of the income-earnings variables, the proportion of married nurses requiring compensation for the hypothetical loss of professional opportunities is 0.90 for nurses aged 22 and 0.22 for nurses aged 52.

Demand for Maternity Leave and Day Care

According to the Survey of Hospital Directors of Nursing, hospitals' provision of maternity leaves of absence to nurses is almost universal, with 90.8 percent of hospitals providing such leaves. By contrast, the provision of day care is virtually

Table 33.—Demand for professional advancement with current employer

Explanatory variables	Married $\log_e(P_1/P_2)$	t	Unmarried $\log_e(P_1/P_2)$	t
Constant	0.345E 01	—	0.295E 01	—
Nurse has AA degree	0.533E-01	0.20	0.258E 00	0.77
Nurse has BA degree	0.656E 00	1.59	0.715E-01	0.20
Nurse has studied at graduate level	0.513E 00	0.45	−0.127E 00	0.17
Nurse's age	−0.573E-01	[1] 5.62	−0.660E-01	[1] 5.33
Number of years nurse with current employer	−0.328E-01	1.33	0.804E-02	0.01
Number of years nurse expects to stay with current employer	−0.610E-02	0.89	0.753E-02	0.83
Nurse qualified and working in a specialty	−0.259E-01	0.14	−0.665E-02	0.00
Nurse's annual earnings	0.132E-04	0.02	0.705E-04	0.94
Spouse's annual earnings	−0.105E-04	0.61	—	—
Household's nonemployment income	−0.411E-04	0.54	0.142E-03	1.09
Percentage of full-time nursing staff positions filled through internal promotion at nurse's hospital	−0.172E-02	0.75	0.341E-02	1.10
Number of beds in nurse's hospital	0.123E-03	0.39	−0.231E-03	0.82
Nurse's hospital subsidizes costs of tuition for nurses who enroll in refresher courses or courses to aid professional advancement	−0.943E-01	0.47	−0.950E-01	0.36
Diplomates at nurse's hospital can frequently fill supervisory positions	0.126E 00	0.44	−0.167E 00	0.51
	$R^2=0.14$		$R^2=0.13$	
	[1] $\chi^2=$ [1] 73.19 (14 d.f.)		$\chi^2=$ [1] 45.04 (13 d.f.)	
	[2] $\bar{P}_1=0.81$		$\bar{P}^1=0.84$	

[1] Means significant at the 1-percent level.

[2] Proportion demanding additional salary for loss in professional advancement with current employer.

nonexistent; only 2.8 percent of the responding hospitals offer this service. The empirical analysis of demand for maternity leaves is based on a question requesting the nurse to state the monthly salary increase she would need to compensate her for the loss of maternity leave benefits.

In providing maternity leaves, the hospital guarantees reemployment after a period of time without loss of position or seniority, and at no lower salary. There are essentially two nonmutually exclusive motives for desiring maternity leaves. First, employed nurses who expect to leave their current position to bear children do not want to be at a disadvantage when they seek employment after an interval out of the labor force. Second, many view maternity leaves as a right; this view is stressed even by those who do not expect to take advantage of the benefit. Unfortunately, there is no available theory with which to differentiate nurses who value leaves for this latter reason. The principal factors explaining variations in demand for the first group are (1) expected fertility, and (2) the expected stay out of the labor force after childbirth. Determinants of fertility are nurse age, hypothesized to have a negative effect; the nurse's annual earnings, with a positive anticipated effect; and the spouse's annual earnings and household nonemployment income, with positive expected effects.[3]

Nurses who expect to remain out of the labor force for very extended periods of time once they have their children cannot expect to benefit personally from maternity leaves. Factors responsible for variations in the stay out of the labor force are (1) the availability of older children and other adults to provide child care, (2) earnings-income variables affecting labor force participation, and (3) the presence of other young children in the household who are likely to reinforce any tendency the nurse may have to stay at home.

Four explanatory variables have been included in the demand for maternity leave benefits equation: Two are the number of children the nurse has in the 7-through-18 age group, and the number of adult dependents of the nurse; the remaining two are a binary variable identifying nurses who have lived in the area since high school, and a spouse hours-of-work variable. Nurses who have lived in the area for sometime are more likely to have established various informal sources of child care outside the household. The area is defined by matching the first two digits of the zip code of the nurse's high school location with the first two digits of her current address. Husbands with flexible hours are

[3] The rationale for these variables is discussed in Schultz (1969), Gardner (1973), and Nerlove and Schultz (1970).

more likely to be available for child care, allowing the wife to return to work.

The earnings-income variables are expected to have the same kinds of impacts on reentry into the labor force as are anticipated for the fertility determinants. Higher nurse earnings should be an inducement to reentry; higher spouse earnings and nonemployment income should decrease the likelihood of early reentry into the labor force.

Separate maternity leave demand regressions have been estimated for married and unmarried nurses in preliminary work. Except for a substantial difference in the constant term, reflecting the lower overall proportion of unmarried nurses valuing this benefit, the results were virtually identical. Only the results for married nurses are presented in table 34.

Virtually all of the variation in the dependent variable that is explained is accounted for by nurse age. Older nurses are clearly far less concerned about maternity leaves. Assuming earnings-income variables to be at their means, the proportion of married nurses valuing leaves is predicted to fall from 0.90 for age 22 nurses to 0.22 for age 52 nurses. Second in importance is the presence of children above the age of 2. The sign of the coefficient associated with the number of school-age children may be explained in terms of the availability of babysitters for infants. The fact that the coefficient of the preschool-age children is also negative, an unanticipated finding, suggests that the children variables may also be accounting for a tendency for households with children to have already reached their desired family size.

Although very few hospitals currently provide day care services, there is some statistical evidence, based on data obtained from nonemployed women, that the provision of satisfactory day care arrangements would induce many women to return to work.[6] Since the Survey of Registered Nurses is limited to responses of employed nurses, it is not possible to assess the potential impact of day care services on nurse labor force participation. Using a willingness-to-pay question, which asks the nurse to place a dollar value on the availability of day care at her current hospital at no out-of-pocket cost *to the nurse*, it is possible to gauge the importance of this benefit to employed nurses.

Table 35 shows the substantial variation in the percentage of nurses placing a positive dollar value on day care according to full-time versus part-time status, and according to various demographic characteristics of the nurse. The table clearly shows day care is primarily desired by nurses who are likely to derive a

[6] A useful reference that discusses public policy issues related to day care is Young and Nelson (1973).

Table 34.—Demand for maternity leave

Explanatory variables	Married $\log_e(P_1/P_2)$	t
Constant	0.472E 01	—
Nurse's age	−0.114E 00	[1] 12.28
Number of nurse's children under age 2	0.265E 00	0.93
Number of nurse's children age 2 to 6	−0.226E 00	1.88
Number of nurse's children age 7 to 18	−0.828E−01	1.36
Number of adult dependents	0.279E−01	0.10
Nurse's annual earnings	0.937E−05	0.20
Spouse's annual earnings	−0.387E−04	0.33
Household's nonemployment income	−0.236E−03	0.00
Nurse's employer counts maternity leave as part of sick leave	0.246E−01	0.14
Nurse lived in same area as high school student	−0.951E−03	0.62
	R^2=0.37	
	χ^2 =[1] 335.23(11 d.f.)	
	[2] $\bar{P}$ =0.59	

[1] Means significant at the 1-percent level.
[2] Proportion demanding additional salary for loss of maternity leave benefit.

Table 35.—Percentages of nurses placing a positive dollar value on day care services, by type of nurse

Type of nurse	Percentage placing a positive value
Full time, married, with children under age 7	74.2
Part time, married, with children under age 7	61.4
Full time, married, no children under age 7, nurse under age 30	40.9
Full time, married, no children under age 7, nurse age 30–54	9.3
Full time, unmarried, no children under age 7, nurse under age 30	20.0
Full time, unmarried, no children under age 7, nurse age 30–54	10.6

personal advantage if such a service were provided.

Table 36 presents ordinary leave squares regression results, based on data on full-time married nurses with children under age 7, and part-time married nurses with children in the same age group. Unlike previous analyses of responses to willingness-to-pay questions, the dependent variable in the table 36 regressions is continuous; it is the raise in the nurse's *monthly* salary regarded as equivalent to the provision of day care services at no out-of-pocket cost to her.

For the most part, the specification of much of the day care demand equation is based on work by Heckman (1974). According to Heckman's research, the availability of informal sources of child care should be positively related to the number of older children, the number of adult dependents of the nurse, spouse work hours, and the length of the nurse's contact with the area.

Nurses may not be indifferent as to the quality of care provided by informational sources, such as relatives and friends, and institution-based services. The latter may provide a more complete program for the child, as well as greater contact with other children. In the sense that the hospital may be able to provide relatively high quality services, households with higher incomes may be more willing to allocate more of their funds for these services.

As seen in table 36, the number of older children has a significantly negative impact on the willingness to pay for day care in both regressions. The length of contact with the area also has a negative effect, which is nearly significant at the 5-percent level. In general, the earnings-income variables show no impact. An exception is nurse's annual earnings in the regression for part-time nurses. Since all of the other earnings-income coefficients

Table 36.—Demand for day care services

	Full time, married, with children under age 7		Part time, married with children under age 7	
	Coefficient	t	Coefficient	t
Constant	44.27	—	45.91	—
Number of children age 7 to 18	−8.10	[1] 2.59	−6.48	[2] 2.34
Number of adult dependents	−34.79	1.23	−5.00	0.33
Spouse's usual work hours (per week)	0.33	0.81	−0.45	0.65
Nurse lived in same area as high school student	−13.59	1.65	−11.51	1.83
Nurse's annual earnings	0.0013	0.81	0.0059	[1] 3.40
Spouse's annual earnings	0.00026	0.27	−0.00042	0.60
Household's nonemployment income	0.00043	0.09	0.00037	0.79
	R^2=0.06		R^2=0.13	
	F(7,172)=1.47		F(7,198)=[1]4.05	
	Mean dep. var.=$60.46		Mean dep. var.=$38.57	

[1] Means significant at the 1-percent level.
[2] Means significant at the 5-percent level.

are insignificant, one should not place too much emphasis on the one significant earnings coefficient. Since part-time nurses are defined to include any nurse working 35 hours per week or fewer, the coefficient may only be reflecting an increased valuation of day care as nurse hours of work (within the part-time group) increase.

Demand for Better Parking Facilities

In contrast to the other nonwage benefits analyzed here, there has been virtually no previous research on the demand for adequate parking facilities. In a study of Detroit nurses, Cleland (1971) found that adequate parking was highly valued by professional nurses, but her work did not involve explicitly specified models.

The dependent variables in the empirical analysis of demand for parking facilities are based on a willingness-to-pay question. The Survey of Registered Nurses asked the nurse to state the dollar amount she would be willing to pay in terms of a reduced monthly salary for better parking facilities. All positive dollar responses assume the value 1 in the logit regression; all zero dollar values are set to equal to zero.

Considering adequate parking to be an amenity, one expects the earnings-income variables to have positive impacts on demand. Nurses who work during the evenings and nights should also tend to be more concerned about parking for safety reasons. Dummy variables identifying nurses who (1) rotate shifts, and (2) typically work the evening or night shift, have been included to account for this influence. Several other dummy variables account for aspects of the current parking situation at the hospital: parking areas at the hospital are now "moderately safe" or "unsafe," versus "safe," as evaluated by the hospital's nursing director; no distant parking areas are available at nurse's hospital; and community size—nurse's hospital is located in a non-Standard Metropolitan Statistical Area (SMSA), nurse's hospital is located in a SMSA with fewer than 300,000 population, and the excluded category, nurse's hospital is in SMSA's with populations over 750,000.[7]

It is reasonable to expect that nurses working in settings with "moderately safe" or "unsafe" parking facilities place a higher value on better parking; whereas nurses working in hospitals with immediate access to parking (including street parking) or hospitals located in smaller communities should value improved

[7] Hospitals and nurses in SMSAs with populations in the above-300,000 and below-750,000 categories were excluded from the Survey of Hospital Directors of Nursing and the Survey of Registered Nurses.

parking less. If a hospital currently provides transportation to distant parking areas and/or provides transportation to other areas (for example, a bus or railroad station), it is less likely the nurses will stress better parking. Finally a nurse-age variable has been included to account for age-dependent differences in nurse preferences. One might well argue that older nurses are more risk averse on the average and therefore would be more concerned about adequate parking facilities.

Table 37 presents the empirical results of the analysis of the demand for better parking facilities. Judged on the basis of statistical significance, work during "off-hours," availability of transportation to distant parking areas, and community size are the most important explanatory variables. However, the transportation variable's coefficient is positive rather than negative, as was anticipated. Probably nurses would prefer to have immediate access to their automobiles instead of having to wait for transportation to more distant areas; and there may be a few hospitals with distant parking areas that have not made some type of transportation arrangements for their employees.

Assuming mean values for age and earnings-income, the probability that a married nurse working in a community with a population of 750,000 and at a hospital with "safe" parking facilities will value better parking is 0.31. Changing "safe" to "moderately safe" or "unsafe" raises the predicted probability to 0.37. Assuming the same size community, "safe" parking, and that the nurse rotates shifts, the predicted probability rises to 0.56. Married nurses located in non-SMSAs and working a regular day shift are predicted to value better parking only 21 percent of the time. Clearly, demand for better parking is highly dependent on the nurse's location and employment situation.

Conclusions

As noted several times during the course of this chapter, there have been surprisingly few studies on nonwage supplements. Yet the dollar-value supplements have been growing at a rapid pace; and, at least as a working hypothesis, it is reasonable to presume supplements may be used by employers as an effective means for attracting and retaining employees. Many supplements, particularly when provided by nonprofit hospitals, have been viewed as wasteful emoluments, which would not be provided if (1) these hospitals were organized on a for-profit basis, (2) were not dominated by physicians who, in effect, use hospitals for their own purposes, and/or (3) full cost-based hospital insurance were not so prevalent. As argued in this chapter, there are valid reasons for employer provision of nonwage benefits; and contrary to the

Table 37.—Demand for better parking facilities

Explanatory variables	Married		Unmarried	
	$\log_e(P_1/P_2)$	t	$\log_e(P_1/P_2)$	t
Constant	−0.42[illegible]E 00	–	−0.211E 00	–
Nurse's age	−0.121E-01	1.64	−0.163E-01	1.92
Nurse's annual earnings	0.248E-04	0.55	0.210E-04	0.39
Spouse's annual earnings	−0.2443-04	1.82	–	–
Household's nonemployment income	0.168E-04	0.26	−0.188E-04	0.22
Nurse rotates shifts	0.537E 00	[1] 3.20	0.554E 00	[1] 2.67
Nurse works evening or night shift	0.939E-01	0.57	0.427E 00	[2] 2.05
Parking areas at nurse's hospital "moderately safe" or "unsafe"	0.249E 00	1.67	0.16[illegible]E-01	0.10
Nurse's hospital provides transportation to distant parking areas	0.841E 00	[1] 2.43	0.856E 00	[1] 2.89
Nurse's hospital provides transportation to other areas	0.139E 00	0.38	−0.760E 00	1.84
No distant parking areas at nurse's hospital	0.991E-01	0.58	−0.119E 00	0.62
Nurse's hospital in non-SMSA	−0.531E 00	[1] 3.03	−0.677E 00	[1] 2.96
Nurse's hospital in SMSA under 300,000 population	0.121E-01	0.00	−0.468E-01	0.22
	R^2=0.08		R^2=0.11	
	χ^2 = [1] 62.12		χ^2 = [1] 59.24	
	[3] $\bar{P}_1$ =0.36		$\bar{P}_1$ =0.44	

[1] Means significant at the 1-percent level.
[2] Means significant at the 5-percent level.
[3] Proportion willing to pay for better parking facilities.

statements of many, an organization interested in minimizing its total labor bill would probably provide some of them. This is not to imply, however, there would be no changes in the provision of benefits if government undertook measures to correct distortions, such as inequities in the Federal tax code.

This chapter is our fourth attempt to assess the importance of specific nonwage benefits to professional nurses. In this chapter, benefits have been analyzed without reference to nurse recruitment and/or retention. It is certainly reasonable to presume, however, that only if a benefit is valued by an employee or prospective employee will it be likely to affect his/her behavior.

Unlike chapters 3, 5, and 6, where assessments of the role of nonwage benefits were also conducted, the focus here has been on interhurse variation in the demand for specific nonwage benefits. Some differences have been found, and overall, our basic hypothesis that there is variation by type of nurse in demand for specific nonwage benefits has been confirmed. Perhaps the most obvious differences are attributable to nurse age. The conceptual and empirical analysis implies that a hospital desiring to attract staff nurses in their twenties would stress general training opportunities and opportunities for professional advancement with the hospital, maternity leave benefits and day care and, somewhat surprisingly, adequate parking facilities. Senior staff nurses are more likely to be attracted by life insurance benefits and retirement plans. Since younger nurses are far more geographically mobile, hospitals attempting to attract nurses from other locations would do well to stress the former types of benefits.

There are also systematic differences dependent on nurse marital status. The fact that the nurse's spouse also has insurance coverage and/or a retirement plan (as judged by the spouse earnings coefficient in the retirement plan regression) has a negative impact on nurse demand for such benefits through her employer. Nurse demand for maternity leave and day care services is highly dependent on the nurse's marital status. One may reasonably infer from the empirical evidence that nurses are more interested in "private" benefits—ones that are of direct value to them—than they are in issues of whether a benefit should or should not be provided as a matter of basic principle (e.g., maternity leave and/or day care). It is very doubtful that professional nurses as a group are very different from persons in other occupations in this regard.

As Blair, *et al.* (1975) noted in *The Geographic Distribution*, many nursing studies are restricted to a particular hospital, or small groups of hospitals, and/or particular geographic location.

Evidence from this chapter serves to emphasize the dangers in making inferences from localized studies. For example, while Cleland (1971), in her survey of Detroit nurses, found that parking is very important to nurses, the predicted probabilities in this chapter demonstrate marked differences in nurses' demand for better parking on the basis of community size. This is clearly not a factor that should be of concern to the hospital located in an "underserved" rural area.

Similarly, demand for a particular nonwage benefit may differ depending on the nurse's own employment situation. Again, referring to the parking analysis, this chapter has shown that nurses working a regular day shift tend to be less interested in better parking. Certainly, hospitals experiencing difficulties in securing professional nurses for "off hours" work would want to take a finding of this nature into account.

Historically, there has been an understandable tension between the economist who tends to explain behavior by pecuniary motives and other social scientists who generally incorporate a much more inclusive list of explanatory influences, often at the cost of conceptual neatness for which traditional economic analysis has been noted. Professionals in general and health professionals in particular are often reluctant to admit that they are motivated by money. They prefer to attribute their behavior to other types of influences. Several chapters in this book, including the present one, have attempted to integrate the potential roles of pecuniary and nonpecuniary influences. Although many, if not most variables have not been shown to be influential, this study's research on nonwage benefits should be viewed as a beginning of work on an important topic. More in-depth studies of demand for nonwage benefits, both within and outside the hospital context are needed.

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Chapter 8

NURSE HOURS OF WORK PATTERNS: A SYNTHESIS

Frank A. Sloan

Introduction

In comparison to the other subjects examined in this study, inquiries into sources of variations in the work hours of professional nurses in particular and of adult females in general have been quite numerous. Although empirical research on the topic has not produced a consensus on the effects of all variables typically included in supply models, the methodological issues are now reasonably well-defined. This chapter provides both a literature review of past studies of work hours and new empirical evidence on the work hours responses of professional nurses.

The results presented in previous chapters indicate that, as a general matter, migration of nurses is not likely to be a very effective method for augmenting the effective supply of nursing services in a particular locality. Thus, it is of some interest to learn whether nurses already employed in an area can be induced to work longer hours and if inactive nurses can be attracted into the labor market; and, if they can, it is important to ascertain which inducements are likely to be the most effective.

By far the greatest emphasis in the literature on work hours has been on the impact of wage rates. From a policy perspective, an exclusive focus on wages is too narrow. Since, however, only a limited amount of information is available on other potential sources of variation in nurse work hours—and some evidence on nonwage sources will be reviewed here—this chapter also emphasizes wage effects because of the considerable previous research conducted in this area. The discussion is essentially limited to the economics literature on this subject. Some of the more technical material is presented in appendix E.

This chapter reviews seven economic studies of nurse labor force participation and hours of work. There have probably been more conceptual advances on the topic of hours of work than any other in the field of labor economics. Studies of hours of work patterns of adult females in general are also reviewed, as many of the results from these more general studies are quite similar to those limited to samples of professional nurses. The chapter

also presents new evidence on professional nurse hours of work patterns, based on an econometric approach recently developed by Professor James Heckman. When research on this chapter began, it was anticipated it would be possible to largely resolve differences in the empirical findings reported in the various studies. Unfortunately, although some generalizations can be made, the differences cannot be fully resolved, given our current knowledge base.

Review of Nurse Labor Force Participation and Hours of Work Studies

The seven studies reviewed here are, in order of publication, Benham (1971), Altman (1971), Bishop (1973), Bognanno, *et al.* (1974), Sloan (1975) and Richupan (1975), and Jones, *et al.* (1976). The first three studies are based on aggregated data. The latter four use data on individual nurses as the observational unit. Recently, there has been a tendency to use micro data more extensively because of (1) the greater availability of micro data files, and (2) the potential for aggregation biases when aggregated data bases are used.

The Benham Study

Benham's model contained three equations: a "demand" equation with median income of female registered nurses in the experienced labor force as the dependent variable; a nurse labor force participation rate equation; and an equation with female registered nurses per 100,000 population in the State as the dependent variable. State data from the 1950 and 1960 U.S. Censuses provided the basis for the regressions. Recognizing that his relationships were logically simultaneous, particularly at an aggregate level such as the State, Benham estimated his regressions using a three stage least squares estimation method.

For purposes of this discussion, Benham's labor force participation regression has the greatest interest. The labor force participation rate was specified as a function of median nurse income, median income of male heads of households in the State (a rough proxy for nurse husbands' income), and the number of children under 5 years of age divided by the number of women between the ages of 15 and 49 ever married in the State (also a crude measure of the number of children of nurses).

The elasticity of labor force participation with respect to nurse income was twice as large in 1960, 0.52, as in 1950, 0.25. Both male income and number of children had negative effects; but because these variables were probably only crude approximations of what they were intended to measure, these results do not merit much

confidence. Nurse income, unlike the other two explanatory variables, referred specifically to nurses; but it would have been far preferable to use a measure of full-time nurse earnings, rather than the median income measure that was employed. It is reasonable to expect that States with high nurse labor force participation rates are also in general the States with high median and mean nurse work hours, conditional on participation. Median income is the product of a wage rate *and* hours of work. As hours of work increase, so does median income. Thus a positive association between nurse labor force participation and median nurse income could have been observed even if there were no underlying relationship. While the definition of income is per se a source of positive bias in the wage parameter estimate, there are other sources of bias that could operate in either positive or negative directions, i.e., aggregation and omitted variables biases. Omitted variables biases are possible in view of the fact that the labor force participation regression only contained three explanatory variables from a much larger list of potential candidates. It is worth stressing that Benham's analysis included both married and unmarried nurses in a single regression; and there is a reasonable consensus, as will be seen, that married nurses are more responsive to financial incentives than their unmarried colleagues. Benham's parameter estimates represent weighted averages of these two categories of nurses.

The Altman Study

Altman specified an equation in which the "full-time equivalent" labor supply of professional nurses in a State was the dependent variable, and the *ratio* of "average" full-time equivalent earnings of professional nurses in the State *to* the average full-time earnings of married males with wife present in the State was the sole explanatory variable. Using ordinary least squares, he estimated the elasticity of labor supply to be 0.86 for married nurses and 0.61 for all (both married and unmarried) nurses. Using two stage least squares, corresponding elasticities of 0.89 and 0.64 were obtained. Altman's data base was the 1960 U.S. Census of Population and the American Nurses' Association 1962 Inventory of Registered Nurses. Altman's study may be considered superior to Benham's for two rather important reasons. First, a measure of full-time equivalent labor supply rather than the labor force participation rate is the dependent variable. The former is a more inclusive measure than the latter. Second, a measure of full-time equivalent nurse earnings was used rather than an income variable, which reflects nurse work hours. The other potential sources of bias remain.

The Bishop Study

Bishop analyzed married nurse labor force participation rates, using a cross section of 141 Massachusetts cities and towns for the year 1966. The locality's participation rate was made a function of the maximum annual starting salary for general duty nurse within 15 miles of the town, median town family income (included as a proxy for husbands' earnings), measures of the wage distribution of nurses in the locality, the proportion of nurses with baccalaureate degrees, measures of accessibility to nursing jobs specific to the locality, and population density. Regressions were estimated with logit analysis.

The elasticity of married nurse labor force participation with respect to wages was reported to be 0.54. As in the Benham study, the proxy for husband's earnings had a negative influence on nurse participation, but again the proxy was quite crude; errors-in-variables bias is therefore suspected.

In most of the other studies of nurse labor supply analyzed here, the nurse wage measure is a mean taken over nurses with a wide variety of attributes. By contrast, Bishop's wage measure was both attribute-adjusted *and* adjusted for hours of work, both desirable. The use of the maximum starting salary implicitly assumes the maximum salary varies positively with the salaries of other grades of professional nurses. Evidence on the structure of wages, presented in chapter 3, is generally consistent with this view. The use of the maximum does present a problem to the extent that a higher proportion of participants than nonparticipants may be eligible for the maximum starting salary. The parameter estimates associated with the percentage of nurses in the town with baccalaureate degrees are negative, a result indicating that labor force participation is lower for nurses with this type of educational background. But the estimates are not statistically significant at conventional levels.

The Bognanno, Hixson, and Jeffers Study

The study by Bognanno, Hixson, and Jeffers is the first of four to be reviewed in this section that used the individual nurse as the observational unit. In their research, the data base is a sample of married nurses from Iowa. As a rule, studies based on individuals include a greater number of explanatory variables, more frequently contain explanatory variables closely related to the theory, and have the advantage of not being subject to aggregation bias.

The explanatory variables in the Bognanno, Hixson, and Jeffers regressions were: the nurse wage rate, measures of the nurse's husband's permanent and transitory income, the number

of children and their ages, and home ownership. Two nurse wage rates were used. One was an hourly rate predicted from a wage-generating equation; the other was the actual straight-time daily earnings of the nurse. The former measure was available for all nurses in the sample; the latter was available for participants only.

The authors employed the twin probability method. In its application to labor supply, this method involves estimating two equations. The first has labor force participation as a zero-1 dependent variable, observations on both labor force participants *and* nonparticipants are included in the first step. In the second, weeks and/or hours of work are dependent variables with the working portion of the sample as the data base. Both steps use ordinary least squares regressions.

Both labor force participation and the two measures of labor supply conditional on participation (weeks worked per year and hours worked per week) proved to be almost completely insensitive to nurse wage rates; elasticities were 0.2 or less.

There are three distinct difficulties with the twin probability approach. First, there is no guarantee that the participation regression (the first stage regression) will not yield predicted probabilities outside the zero-1 interval. Second, as discussed more fully later, it can be shown that the parameter estimates of the second step regression are biased; in particular, the wage parameter estimates are biased toward zero. Third, the procedure does not take account of the covariance of the error terms between the first and the second regressions, producing biased predictions (Hall, 1973). Tobit analysis, which is a one-step procedure, is designed for the same type of situation and is not subject to the first and third deficiencies. But the Tobit technique may overcorrect, causing the wage parameter estimate to be overstated.

The authors' low estimated wage elasticities in the second-step weeks and hours of work regressions can be explained in econometric terms. However, unlike the study by Jones and his associates, to be reviewed later, where an interpretation is possible, there is no obvious statistical reason for the very low wage elasticity obtained from the first-step labor force participation regression.[1]

Even though nurse husbands' earnings were measured far more precisely in this study than in those previously reviewed,

[1] The wage series used in both sets of regressions is derived from an instrumental wage regression. If this regression explained nurses' wages poorly, the wage parameter estimate in the labor force participation regression would be downward-biased. However, the authors did not present the wage regression in their article. Thus, it is only possible to speculate on this point.

associated elasticities reported in Bognanno, *et al.*, with respect to the labor supply variables, are low.[2] With weeks worked per year and hours worked per week as the dependent variables, elasticities in the −0.08 to −0.12 range were obtained. With labor force participation as the dependent variable, the authors found elasticities of labor force participation responsiveness in the neighborhood of −0.28. There is reason to suspect that the low responsiveness of weeks and hours of work to husbands' earnings reflects an econometric problem, i.e., the use of a participants-only sample. Since both labor force participants and nonparticipants were included in the labor force participation regressions, there is no reason to suspect bias in this case.

The Sloan Study

Sloan analyzed hours worked per week and hours worked per year. Hours per year were defined to be hours worked in a reference week times weeks worked in the previous year. Data came from the Survey of Registered Nurses, which included only employed nurses. For this reason, Sloan's econometric work is subject to the same bias as that of Bognanno, *et al.* Of course, the biases apply only if one desires to generalize to all professional nurses, both labor force participants and nonparticipants. However, both studies are useful for generalizing about hours and weeks of work for a category of nurses, i.e., employed nurses.[3]

Sloan specified work hours to be a function of nurse age, nurse and spouse health, marital status, presence of children and adult dependents in the household, husband's earnings, type of nurse training, the nurse's wage, and various kinds of financial and nonfinancial incentives provided by the hospital that may influence the nurse to work full time rather than part time. This list of explanatory supply variables is substantially longer than those of all the other studies reviewed in this section.

The nurse wage coefficients only attained statistical significance in the annual hours regression, with an associated elasticity evaluated at the observational means of 0.16. This elasticity is similar to Bognanno, Hixson, and Jeffers', who used a comparable sample, but is well below those obtained in studies using aggregated data. The spouse earnings elasticities are also very close to those reported by Bognanno and his colleagues.

Sloan's study is the only one to assess the influence of day care facilities on nurse work hours. Although a positive impact was expected, the regression that included a day care facilities vari-

[2] Imprecise measurement would most likely result in parameter estimates biased toward zero.

[3] "Employed" and "participating" nurses are used interchangeably, because the nurse unemployment rate is virtually zero. See chapter 5 for a discussion of this point.

able demonstrated a significantly negative impact. This result serves to emphasize the danger in working with a participants-only sample. It is likely hospitals offering day care are able to attract part-time nurses, but such facilities do not provide an incentive for full-time as opposed to part-time work. Since hospitals offering day care may well have a higher proportion of part-time nurse employees, day care would appear to have a negative effect when only participants are analyzed; but this variable's direction of effect would be reversed if a sample including non-participants, as well as participants, were analyzed.

Probably the most important result of Sloan's study is loan forgiveness appears to have a positive effect on nurse hours of work. Given the criteria for loan forgiveness, nurses with forgiveable debts have a definite incentive to work full time and to avoid leaving the labor force for brief periods of time (such as the summer).

Tests were performed to determine any independent effect of nurse training, holding a large number of other explanatory influences constant, including nurse wages. The regression results indicated the associate degree graduate works considerably longer on an annual basis than her diploma or baccalaureate degree colleagues, a result roughly consistent with the Bishop study. Type of degree may, of course, be picking up various socioeconomic factors relative to the kinds of persons who choose various types of educational programs.

Sloan included variables representing the availability of such fringe benefits as life and health insurance to full-time nurses in his work hours regressions. The view that fringe benefits for full-time workers provide an incentive to full-time work received no support. Loan forgiveness proved to be the exception in this regard, not the rule.

The Sloan-Richupan Study

The Sloan-Richupan study used individual records on professional nurses and their families from the public use sample of the 1960 U.S. Census of Population to estimate equations for hours worked per week and hours worked per year. It is the only study of the seven that employed Tobit analysis in regressions based on samples of participating as well as nonparticipating nurses. Labor supply regressions for participants-only were also presented. Their specification is not reviewed here, since this study will be discussed in much greater depth later.

Elasticities of nurse work hours with respect to the nurse wage—very comparable to those of Bognanno and his colleagues—were obtained when the Bognanno, *et al.* estimation

technique was employed. With Tobit, however, Sloan-Richupan obtained wage elasticities for married nurses above 1.0 and as high as 2.8. The same pattern holds for elasticities representing the responsiveness of nurse work hours to spouse wages. Depending on the technique employed, the spouse wage elasticities for married nurses ranged from −0.14 to −1.73. Elasticities near zero were obtained with the Bognanno, *et al.* method; the higher ones were obtained using Tobit.

Sloan-Richupan found unmarried nurses' work hours to be fairly unresponsive to financial variables irrespective of the regression technique employed. That empirical results for unmarried nurses have been shown to be invariant with respect to the technique used is not at all surprising, since the vast majority of unmarried nurses are participants.

The Jones-Cooley-Miedema-Hartwell Study

Jones and his colleagues estimated labor force participation and hours worked per week regressions using the twin probability approach. Data came from two Public Use samples of the 1970 U.S. Census. The independent variables were virtually the same as in the Bognanno, *et al.* study. Probably the major difference in specification is in the nurse wage variable, which in the Jones, *et al.* study was median income of all professional nurses in the State who worked full time (presumably 50 to 52 weeks) during 1969. Since there is likely to be as much intrastate as interstate variation in nurse wage rates, their specification probably introduced serious measurement errors into their nurse wage series. Such measurement errors are reason enough for finding the insignificant effects of nurse wages reported by the authors. The Bognanno, *et al.* and Sloan-Richupan studies, on balance, deserve more serious consideration as examples of research using the twin probability method.

Although there is a substantial range in the elasticity estimates, there is a consistent pattern across studies based on individual nurse observations; and the pattern is compatible with what one would expect on the basis of statistical theory. Those interested in the pertinent theoretical concepts should consult appendix E.

General Studies of Female Labor Supply

It is beyond the scope of this study to review the voluminous literature on the labor supply of women, a subject that has received a considerable amount of attention from researchers. Some recent developments in this field, however, are pertinent to our focus on nurse labor force participation and hours of work.

There have been at least three generations of work on this topic in the past decade and a half. The first of these is characterized by the studies of Mincer (1962), Cain (1966), and Bowen and Finegan (1969). Their work emphasized determinants of labor force participation. Much of the empirical research was based on aggregated data, although there was some analysis at the level of the individual. The Benham, Altman, and Bishop studies on professional nurse labor force participation fall roughly into this category.

The second generation encompasses micro-oriented work directed at assessing the potential impact of income maintenance programs on labor supply.[4] A substantial portion of this research is included in Cain and Watts (1973), and is summarized and synthesized in the book's final chapter. Probably most useful is a table developed by Cain and Watts presenting elasticity estimates from several "second generation" (my term) studies. Some of the techniques, such as the twin probability approach used by Boskin (in the Cain and Watts book), parallel the nurse labor supply studies by Bognanno and his colleagues, and part of the Sloan-Richupan work. As in the nursing studies using the twin probability method, Boskin found adult female hours of work to be only slightly responsive to females' wages and husbands' incomes.

The third generation's focus is on the problem of valuing an individual's time, which is intimately related to work hours analysis. While the price of an employed person's time may be taken as equal to his market wage rate, there are complexities in pricing the time for unemployed persons. An understanding of time prices is not only useful in analyzing labor force decisions, but also in assessing such varied decisions as individuals' choice among alternative transportation modes and among various types of ambulatory care settings. Examples of studies in the third category are Cogan (1974), and Heckman (1974, mimeo.). A study by Schultz (1974) falls roughly in between the second and third generations, and is useful for purposes of comparison with the nursing studies. A review of the methods and empirical results of the Schultz, Cogan, and Heckman studies is extremely helpful for interpreting the widely varying findings reported in the nursing studies.

The Schultz Study

Schultz obtained empirical estimates of work hours functions for married women in 10 age and race groups, using the 1967

[4] See Rees (1974) for a summary of the major results obtained up to 1974 from income maintenance experiments.

Survey of Economic Opportunity (SEO). Schultz found work hours to respond positively to female wage rates in each of the groups, with the highest associated elasticities corresponding to the youngest and oldest age groups and the lowest elasticities for women in the 35 to 44 age group.

The elasticities of married women's work hours with respect to their husbands' wages are reported to be negative and about the same in magnitude (in absolute value) as those relating work hours to their own wages. The elasticities associated with husbands' wages varied from −0.38 to −1.65. As in the nursing studies, Schultz found the impact of nonemployment income on labor supply of married women to be weak.

Methodologically, the Schultz study is quite similar to Sloan-Richupan's. In both cases, wage rates (for the adult female and professional nurses, respectively) were predicted from a wage-generating equation; these were then used as explanatory variables in work hours regressions, based on samples of nonparticipation *and* participants. In both, main reliance was placed on labor supply parameter estimates obtained from Tobit analysis, although empirical results using alternative techniques were also presented. Schultz's elasticities based on the Tobit technique are very close to Sloan-Richupan's elasticities using the same technique. Schultz's elasticities derived from ordinary least squares applied to a participants-only sample are very close to the nursing studies using this approach. It is apparent that the differences among the studies are systematically related to differences in the statistical techniques employed and do not depend on whether a nursing sample or a more general sample is used.

The Cogan Study

Cogan assessed four approaches to estimating the price of an employed person's time and parameters of work hours equations. Three of these approaches are discussed in appendix E. The first is based on a sample of labor force participants, while the second used the entire sample with a wage predicted from a wage-generating equation. The third approach is one devised by Gronau (1973) in which the price of the nonemployed person's time is estimated directly from information on market wages and labor force participation rates. Cogan was very critical of Gronau's method and since Gronau alone has used his method, there is no reason for considering his approach here. The fourth approach (the third in appendix E) is a maximum likelihood method developed by Heckman (1974) and subsequently simplified in Heckman (mimeo.). Using this procedure, Heckman

derived parameters of market wage and work hours functions simultaneously.

Much of Cogan's theoretical material is reviewed in appendix E. Here, the emphasis is on his empirical comparisons of the approaches, using a sample of women from the 1967 National Longitudinal Survey. Cogan found that parameter estimates of female hours of work regressions are extremely sensitive to the procedure employed. The Tobit estimates tended to be the largest in absolute value, i.e., more positive when positive and more negative when negative. The parameter estimates based on ordinary least squares using a participants-only sample tended to be the smallest in absolute value. Estimates based on Heckman's procedure, the most theoretically sound approach, fell somewhere in between. Unfortunately, Cogan did not present data on sample means which would permit one to calculate elasticity estimates; but comparing the parameter estimates themselves, the differences are indeed substantial. The empirical work is an important supplement to the theory. The theory can suggest a bias will occur if the error term exhibits certain properties, but only by analyzing data can one learn if these properties are in fact important.

Although Cogan's empirical work is highly suggestive, there are some limitations to its generalizability. First, the empirical results were obtained from one sample; results from other samples may or may not confirm his findings. However, the Schultz and the nursing studies, when taken together, do in fact tend to confirm Cogan's findings. Furthermore, Cogan's empirical findings are undoubtedly sensitive to the completeness with which market wage and work hours models are specified. Differences among the approaches arise because important explanatory variables are omitted, either because of inadequacies in the underlying theory or because of limitations of (secondary) data bases. Finally, even though the Tobit method is not fully satisfactory in terms of the parameter estimates it generates, Cogan reported the technique performed much better in terms of another objective, deriving estimates of the time price of nonemployed persons.

The Heckman Studies

The principal deficiency of Heckman's (1974) procedure is its cost. Heckman (mimeo.) develops a far less costly method, one that is used in the following section with Sloan-Richupan's model and 1960 U.S. Census data base. The following material is technical; readers not well versed in econometric methods are advised to skip to the next section, which summarizes this section's results.

Heckman specified equations for the shadow wage and the market wage:

$$(8.1) \quad W_s = \gamma_0 + \gamma_1 E_m + \gamma_2 Z + u_1$$

$$(8.2) \quad W_f = \beta_0 + B X_1 + u_2$$

where: X is a vector of exogenous determinants of the market wage; and u_1 and u_2 are error terms of the shadow wage and market wage equations, respectively.

Heckman derived equations for work hours and the market wage that are estimatable on the subsample of participants but are free of the statistical problems described above.
These equations are:

$$(8.3) \quad E_m = \frac{\beta_0 + \beta_1 X - \gamma_0 - \gamma_2 Z}{\gamma_1} + \frac{\lambda \sigma^*}{\gamma_1} \quad \text{and}$$

$$(8.4) \quad W_f = \beta_0 + \beta_1 X + \lambda \left[\frac{\sigma_2^2 - \sigma_{12}}{\sigma^*} \right]$$

According to Heckman, both equations (8.3) and (8.4) are to be estimated with ordinary least squares. Equation (8.3) is estimated with work hours as the dependent variable and X and Z vectors and λ as explanatory variables. Equation (8.4) has the market wage as the dependent variable and X and λ as explanatory variables. Thus, the ratios $\frac{\sigma^*}{\gamma_1}$ and $\frac{\sigma_2^2 - \sigma_{12}}{\sigma^*}$ are obtained as parameter estimates.

Unfortunately, it is *only* possible to obtain a unique estimate of the crucial parameter relating work hours to our wages, γ_1, if only one X does not appear among the Z. That is, conditions for exact identification are satisfied. If more than one X does not appear among the Z, which is very likely in a satisfactorily specified set of (8.3) and (8.4) equations, there will be several estimates of γ_1.

Professor L. F. Lee has suggested estimating a work hours equation of the following form, using market wages predicted from (8.4).[5]

$$(8.5) \quad F_m = \gamma_0 + \gamma_1 \hat{W}_f + \gamma_2 Z + \theta \left[\frac{\sigma_1^2 - \sigma_{12}}{\sigma^*} \right] + u_1 ,$$

where: $\hat{W}_f$ signifies the predicted market wage.
Line λ in equation (8.3) θ is a variable in equation (8.5). The equation is estimated using a sample of participants. Except for a term involving θ, to account for the fact that only participants

[5] The suggestion was in a personal communication.

are included when (8.5) is estimated, equation (8.5) is a "standard" hours of work equation.

The formulas for λ and θ are somewhat cumbersome and for this reason will not be given here. Both are based on transformations of the predicted values from a probit regression, based on the sample of participants and nonparticipants. Whether or not the person participates is the probit regression's dependent variable. Explanatory variables are members of the exogenous variable sets X and Z.[6] As the proportion of participants approaches 1, λ and θ approach zero. Thus, λ and θ are not important variables for groups in which participation is nearly universal, e.g., men and unmarried women.

The principal difference between Heckman-type methods and more traditional methods for estimating labor supply functions is the presence of λ and θ in the former.

Evidence on Nurse Work Hours Using Heckman Estimation Method

In this section, Sloan-Richupan's basic model and data are used in empirical research on nurse work hours using the Heckman estimation method. As noted in the previous section, a probit regression with zero-1 dependent variable indicating the respondent's participation status must first be estimated for purposes of calculating λ and θ. Exogenous variables corresponding to both X and Z vectors are the explanatory variables in this probit regression. Values of λ and θ, respectively, enter market wage and work hours regressions estimated using ordinary least squares. There are some essentially minor differences in specification between the Sloan-Richupan model and the one presented here (more detail on the basic model's specification is presented in the Sloan-Richupan study). All supply results in this section are based on married nurses only. Participation rates among unmarried nurses are sufficiently high so as to call the potential usefulness of a Heckman-type procedure into question.

The exogenous variables (the Zs) included in Sloan-Richupan's labor supply model are: the spouse's hourly wage (WS); the household's nonemployment income (Y); the number of children in the household under age 2 (C1); the number of children in the household 6 to 15 years old (C3); the number of children in the household 16 to 19 years old (C4); the number of adults other than the spouse under age 65 living in the household (AG1); the number of adults other than the spouse aged 65 to 74 living in the

[6] See Heckman (mimeo.). The formula for θ is not given by this source. The numerator is the same for both λ and θ; however, the denominators differ. θ's denominator is 1 minus the denominator for the λ expression.

household (AG2); nurse age (A1 and A2); race (B); foreign birth (F); and a variable indicating whether the husband has been out of work (U).

Sloan-Richupan defined the following variables as determinants of the nurse's market wage (the Xs): race (B); foreign birth (F); movement within or between States in the 1955–60 period (M1 and M2); per capita income in the State (YPCP); RN and LPN population ratios in the nurse's State (RNPOP and PNPOP); the nurse's Census Division (NE, MA, ENC, ESC, WSC, M, and P—with South Atlantic, SA, Census Division excluded from the regression); nurse experience with nurse age-children interaction variables as proxies (RNA1 through RNA3C); duration of the nurse's education (COL4 and COL56); type of employer in present or most recent job (WKCL2 and WKCL3); degree of urbanization of nurse's residence (WKCC, WKSMSA, and WK1); and part- versus full-time work status (PT). Predicted wages generated from the market wage regression were used as an explanatory variable in Sloan-Richupan's work hours regression. For purposes of prediction, the part-time variable (PT) was set equal to its mean value.

In an effort to reduce multicollinearity in the work based on Heckman's method, children, C1 through C4, and nurse age, A1 and A2, variables replace the nurse age-children interaction variables used by Sloan-Richupan in their market wage regression. Moreover, in the course of conducting this empirical research, it became apparent that the three Sloan-Richupan location variables, WKCC, WKSMSA, and WK1 always assume the value zero in the case of nonparticipating nurses. To gauge the effects of this potentially serious error, two of the regressions in the earlier study were reestimated, correcting this problem. Fortunately, estimates of the parameters of key explanatory variables in the Sloan-Richupan study were virtually unaffected by this error.

Probit Regression Results

Table 38 presents the results of two participation regressions estimated by the probit method.[7] Participation has been defined for purposes of this empirical analysis in two ways: The first defines the nurse to be a participant if a measure of annual work hours is positive; the second defines participation in terms of weekly work hours. Annual hours are the product of weeks worked during 1959 and hours worked during a census "reference" week in 1960; and weekly hours only refer to hours worked during the reference week. It thus is possible for annual hours to

[7] See Goldberger (1964) for a description of probit analysis.

Table 38.—Participation and hourly wage equation regression results with 0–1 dependent variables for participation [1]

Explanatory variables	Annual hours	Weekly hours	Hourly wage (OLS) [2]
WS	[4] −0.369	[4] −0.381	–
	(0.045)	(0.044)	(–)
Y	[3] −0.0004	[3] −0.0005	–
	(0.0002)	(0.0002)	(–)
C1	[4] −0.651	[4] −0.635	–
	(0.051)	(0.051)	(–)
C2	[4] −0.393	[4] −0.388	–
	(0.034)	(0.034)	(–)
C3	−0.008	−0.004	–
	(0.027)	(0.027)	(–)
C4	[3] 0.197	[4] 0.252	–
	(0.084)	(0.086)	(–)
AG1	0.100	0.108	–
	(0.111)	(0.111)	(–)
AG2	0.066	0.069	–
	(0.166)	(0.166)	(–)
AG3	0.101	0.121	–
	(0.197)	(0.199)	(–)
A1	−0.154	[3] −0.163	–
	(0.081)	(0.081)	(–)
A2	[3] −0.150	[3] −0.148	–
	(0.070)	(0.071)	(–)
B	0.035	0.038	−0.063
	(0.144)	(0.144)	(0.102)
F	0.006	0.148	0.023
	(0.129)	(0.129)	(0.097)
U	0.382	0.341	–
	(0.336)	(0.337)	(–)
YPCP	[3] 0.0014	0.0009	0.0001
	(0.0007)	(0.0007)	(0.0001)
RNPOP	−0.090	−0.069	0.110
	(0.132)	(0.132)	(0.117)
PNPOP	0.118	0.106	−0.104
	(0.098)	(0.097)	(0.088)
COL4	−0.066	−0.054	[4] 0.180
	(0.068)	(0.067)	(0.057)
COL56	−0.016	−0.067	[4] 0.367
	(0.102)	(0.103)	(0.080)
WKCL2	[3] 0.128	[3] 0.150	[4] 0.258
	(0.059)	(0.060)	(0.049)
WKCL3	[4] −0.421	[4] −0.388	0.163
	(0.096)	(0.096)	(0.087)
M1	−0.092	−0.131	−0.112
	[4] (0.073)	(0.073)	(0.065)
M2	[4] −0.190	[4] −0.178	−0.017
	(0.066)	(0.066)	(0.062)
NE	[4] −0.418	[3] −0.396	0.058
	(0.197)	(0.197)	(0.169)

Table 38.—Participation and hourly wage equation regression results with 0–1 dependent variables for participation [1]—Continued

Explanatory variables	Annual hours	Weekly hours	Hourly wage (OLS) [2]
MA	[4] −0.329	[4] −0.321	0.019
	(0.112)	(0.112)	(0.093)
ENC	−0.308	−0.251	0.104
	(0.104)	(0.104)	(0.094)
WNC	[4] −0.335	[3] −0.278	−0.003
	(0.122)	(0.122)	(0.102)
ESC	−0.037	−0.015	0.210
	(0.165)	(0.165)	(0.134)
WSC	[3] −0.294	[3] −0.250	0.175
	(0.126)	(0.126)	(0.107)
M	[4] −0.437	[4] −0.340	0.219
	(0.132)	(0.132)	(0.122)
P	[4] −0.417	[4] −0.366	0.028
	(0.127)	(0.127)	(0.107)
RNA1	–	–	[4] −0.375
	(–)	(–)	(0.067)
RNA1C	–	–	−0.039
	(–)	(–)	(0.040)
RNA2	–	–	[3] −0.156
	(–)	(–)	(0.071)
RNA2C	–	–	[4] −0.093
	(–)	(–)	(0.023)
RNA3C	–	–	[3] −0.051
	(–)	(–)	(0.021)
MARRD	–	–	−0.069
	(–)	(–)	(0.053)
WKCC	–	–	[3] 0.180
	(–)	(–)	(0.089)
WKSMSA	–	–	0.146
	(–)	(–)	(0.092)
WK1	–	–	0.044
	(–)	(–)	(0.096)
PT	–	–	[4] 0.698
	(–)	(–)	(0.048)
CONSTANT	[4] 1.27	[4] 1.44	1.74
	(0.34)	(0.33)	(–)
	[4,5] χ^2_{32} = 693.35	[4,5] χ^2_{32} = 700.18	R^2 = 0.16
			F(29,1933)= [4] 12.46

[1] Participation rates differ for annual and weekly hours since a nurse may have worked during the April 1960 "reference week" but not at all during 1959. Participation rates for the two regressions are 0.48 and 0.46, respectively.

[2] OLS stands for ordinary least squares.

[3] Means significant at the 5-percent level.

[4] Means significant at the 1-percent level.

[5] There are 32 degrees of freedom.

be zero and for weekly hours to be positive, because the nurse did not work at all during 1959. On the whole, the empirical results

are insensitive to whether the annual or the weekly hours definition is employed.

Assuming that the relationship between nurse work hours and nurse wage rates is positive—a notion the labor supply literature on the whole supports—any variable that increases nurse wages increases participation and the reverse. Table 38 also contains a market wage regression from the Sloan-Richupan study (results not published previously).

Judging from the significance levels of particular variables in the probit regressions, the most important participation determinants are (1) the spouse wage, (2) nonemployment income, (3) the presence of children in the household, (4) nurse age, (5) per capita income, (6) employment status, and (7) region. Surprisingly, years of nurse education demonstrate no significant effect on participation. On the basis of the coefficients associated with the nurse education variables, it appears that nurses with more years of formal education tend to participate less, even though their wages are higher on the average. This result is consistent with past work on nurse work hours (Bishop, and to a lesser extent, Sloan). The measures of RN and LPN availability are statistically insignificant in all three regressions, a result that runs counter to chapter 3's finding in this regard, as well as to Benham's (1971) research that showed the professional nurse population ratio to have a significantly negative impact on nurse wages.

Market Wage Regression Results: With and Without Heckman's Adjustment

Table 39 shows the effects of (1) respecifying the Sloan-

Table 39.—Wage equation regression results: With and without Heckman's adjustment

Explanatory variables	Hourly wage without adjustment	Hourly wage with adjustment
C1	[1] 0.262	−0.044
	(0.072)	(0.119)
C2	0.064	−0.119
	(0.046)	(0.073)
C3	[2] −0.062	[2] −0.071
	(0.030)	(0.030)
C4	−0.033	−0.052
	(0.080)	(0.084)
A1	[1] −0.268	[1] −0.259
	(0.087)	(0.087)
A2	−0.082	−0.131
	(0.076)	(0.078)

Table 39.—Wage equation regression results: With and without Heckman's adjustment—Continued

Explanatory variables	Hourly wage without adjustment	Hourly wage with adjustment
B	0.069	0.179
	(0.149)	(0.151)
FR	−0.008	0.001
	(0.149)	(0.149)
YPCP	[1] 0.0003	[1] 0.0003
	(0.0001)	(0.0001)
RNPOP	0.106	0.087
	(0.152)	(0.151)
PNPOP	−0.137	−0.109
	(0.114)	(0.113)
COL4	[2] 0.205	0.158
	(0.081)	(0.082)
COL56	[1] 0.395	[2] 0.301
	(0.124)	(0.127)
WKCL2	0.072	0.135
	(0.067)	(0.070)
WKCL3	[2] 0.310	0.149
	(0.123)	(0.132)
M1	−0.020	−0.085
	(0.089)	(0.090)
M2	0.024	−0.054
	(0.084)	(0.088)
NE	0.153	0.096
	(0.232)	(0.232)
MA	0.132	0.042
	(0.126)	(0.129)
ENC	0.114	0.044
	(0.112)	(0.114)
WNC	0.177	0.126
	(0.137)	(0.138)
ESC	0.261	0.272
	(0.183)	(0.183)
WSC	0.256	0.178
	(0.144)	(0.146)
M	0.252	0.138
	(0.155)	(0.158)
P	0.117	0.005
	(0.144)	(0.147)
LAMBDA	–	[1] 0.734
	(–)	(0.228)
CONSTANT	1.54	1.19
	(–)	(–)
	R^2 = 0.05	R^2 = 0.05
	F(25,1438) = [1] 2.89	F(26,1437) = [1] 3.20

[1] Means significant at the 1-percent level.
[2] Means significant at the 5-percent level.

Richupan market wage equation for purposes of this research, and (2) including a term (LAMBDA) as a means for correcting the statistical problem that arises when regressions are estimated with a participants-only sample. Comparing table 38 and table 39 wage regression results, it is clear that some of the modifications of Sloan-Richupan's market wage equation necessary for purposes of implementing the Heckman procedure result in substantially lower R^2s. Much more important to this discussion, the LAMBDA term's coefficient is statistically significant with a positive sign. But, with the exception of two of the children variables, the coefficients of other explanatory variables are generally unaffected by the inclusion of LAMBDA. Heckman's adjustment apparently does not make much difference in the case of the market wage equation, at least with the Sloan-Richupan sample.

Work Hours Regression Results: With and Without Heckman's Adjustment

Table 40 presents hours of work regressions with and without the Heckman adjustment term. The parameter estimate associated with THETA is statistically significant in the regression with annual hours as the dependent variable, but not in the weekly hours regression. In the annual hours regression, including the THETA term tends to drive some of the statistically significant parameter estimates toward insignificance. Theoretically, one anticipates that the parameter estimates in work hours regressions based on a participants-only sample are biased toward zero in the absence of an adjustment. In table 40, the Heckman adjustment has the effect of changing the estimates in the opposite from the anticipated direction.

The nurse wage coefficient in the weekly hours regression with THETA included implies virtually the same elasticity as does the corresponding regression in Sloan-Richupan (0.19 in table 40 versus 0.16 in Sloan-Richupan). The Sloan-Richupan regression used ordinary least squares on a sample of employed married nurses. The table 40 regressions are also based on an employed sample. Although based on a different method, the table 40 regressions have the appearance of what they are in the absence of the Heckman adjustment, ordinary least squares (OLS) regressions based on a participants-only sample. Cogan's comparisons of Heckman's more costly maximum likelihood technique with the results of OLS participants-only regressions showed the Heckman-derived wage elasticities to be much higher than those obtained from OLS participants-only regressions. Certainly, more econometric research is needed on the Heckman method

Table 40.—Hours equation regression results: With and without Heckman's adjustment

Explanatory variables	Annual hours		Weekly hours	
	w/o adj.	w/ adj	w/o adj.	w/ adj.
WS	[1] −104.90	−6.62	[1] −2.36	[1] −2.30
	(38.48)	(47.50)	(0.61)	(0.78)
Y	−0.011	−0.001	−0.0005	−0.0005
	(0.016)	(0.017)	(0.0003)	(0.0003)
C1	[1] −403.30	−235.90	[1] −5.98	[1] −5.88
	(53.36)	(71.47)	(0.85)	(1.14)
C2	[1] −179.15	−63.34	[1] −3.23	[1] −3.16
	(29.36)	(44.14)	(0.46)	(0.71)
C3	[1] −75.76	−63.36	−0.590	−0.590
	(20.47)	(20.69)	(0.327)	(0.327)
C4	80.04	8.91	0.636	0.636
	(50.51)	(54.25)	(0.905)	(0.904)
AG1	94.50	60.43	[2] 2.76	[2] 2.74
	(75.06)	(75.40)	(1.18)	(1.19)
AG2	19.50	4.67	0.817	0.809
	(109.09)	(108.75)	(1.71)	(1.72)
AG3	47.13	33.62	−0.261	−0.273
	(129.53)	(129.09)	(2.04)	(2.03)
A1	−161.99	−69.11	−0.301	−0.241
	(56.47)	(62.18)	(0.892)	(1.02)
A2	−63.85	2.04	−1.08	−1.04
	(48.50)	(51.84)	(0.76)	(0.83)
B	43.37	−31.48	−1.38	−1.43
	(96.90)	(98.86)	(1.52)	(1.57)
FR	−36.63	−34.14	−1.18	1.18
	(92.40)	(93.86)	(1.47)	(1.47)
U	17.83	−126.78	5.34	5.27
	(175.33)	(179.46)	(2.75)	(2.81)
WN [3]	−99.12	−0.146	3.08	3.14
	(98.63)	(102.23)	(1.60)	(1.69)
THETA1 [4]	–	[1] 522.60	–	–
	(–)	(149.15)	(–)	(–)
THETA2 [4]	–	–	–	0.300
	(–)	(–)	(–)	(2.47)
CONSTANT	2253.81	1133.52	39.00	38.33
	(–)	(–)	(–)	(–)
	R^2=0.14	R^2=0.15	R^2=0.11	R^2=0.11
	F(15,1448)=	F(16,1447)=	F(15,1448)=	F(16,1447)=
	[1] 16.21	[1] 16.08	[1] 12.46	[1] 11.77

[1] Means significant at the 1-percent level.
[2] Means significant at the 5-percent level.
[3] WN is the predicted nurse's wage.
[4] THETA1 is based on a probit regression using the annual hours screen. THETA2 is based on a probit regression using the weekly hours screen.

employed in this section; by examining the steps involved, it is clear his approach introduces a great deal of multicollinearity.

Conclusions

If a review of the nurse hours of work literature had been conducted only as recently as 3 years ago, matters would have been much less complicated. This is certainly a topic in which "ignorance *was* bliss." I, for one, could have concluded that labor force participation and work hours of married nurses in particular is *very* responsive to nurse wages, as the Sloan-Richupan study implies. To the degree nurses are that responsive to financial incentives, a high wage policy becomes an extremely attractive instrument for augmenting nurse supply in underserved areas, even possibly dominating nurse training, which on the whole receives rather favorable support in this study. In fact, Sloan-Richupan favored policies to increase work hours of the existing supply over expanded nurse training for this reason.

Although there is still reason to be confident that financial incentives can be successfully used to increase the supply of nurses from the existing nurses' pool within a community, there is now reason to believe that Sloan-Richupan's estimates of the responsiveness of married nurse work hours to financial variables are overstated; there has been no change in my views on the Sloan-Richupan results for unmarried persons, which indicated a much lower response in the first place. Furthermore, policies aimed at increasing the effective supply of nursing services of nurses already located in currently underserved areas appears far more likely to succeed on the whole than policies directed at attracting nurse inmigrants from other areas.

As is evident to anyone reading this chapter, there has been a spate of articles by labor economists on econometric problems involved in the empirical analysis of adult women's work hours patterns. In assessing the results of the nursing studies, it is not possible to neglect recent research findings outside of the nursing literature.

The nurse hours of work studies differ in terms of details of the underlying model, data bases used in regression analysis, and econometric technique. In general, this chapter has devoted more attention to studies based on individual nurse observations. As a rule, micro data are preferable; moreover, equation specification has tended to be more complete in the micro-oriented studies.

The central concern in the nurse hours of work studies, as in the economics literature in the area, has been on the effects of such "economic" variables as nurse wages, spouse wages, and nonemployment income on labor force participation and work hours. As a rule, nurse and spouse wages have been seen to have some impact, while nonemployment income's effect is usually

reported to be small. There has been, however, considerable dispute concerning the magnitude of responses to wages. In this regard, estimates differ by a factor of 10 or more.

The review of the pertinent studies on econometric methods and adult women work hours patterns, taken in conjunction with the nursing studies, suggests that the low elasticity estimates for married nurses, such as those reported by estimates of Bognanno, Jones, and associates are correct is premature. Probably the true estimate does lie in between. Bognanno, *et al.* and Jones, *et al.* are too low; and the results based on Tobit analysis in the Sloan-Richupan study are too high. In an attempt to obtain elasticities that are "just right," the Sloan-Richupan equations were reestimated using a modified version of a procedure recently developed by Professor James Heckman. The resulting elasticities are quite close to the lower estimates obtained by Bognanno, *et al.* and Jones, *et al.*—and by Sloan-Richupan when they used their method. Judging from research reported in Cogan (1974), the elasticities, based on Heckman's method, should have been higher than those obtained in this chapter. The low estimates reported here may reflect multicollinearity; to conclude that estimates of Bognanno, Jones, and associates are correct is premature. Probably the true estimate does lie in between.

With the exception of the research findings based on the Heckman adjustment, there is a definite consistency among the studies reviewed here when the same estimating technique and the same kind of data base are used. In fact, results for nurses are quite close to those for adult women in general. This conclusion supports evidence on nurse migration patterns reported in chapter 4. There, as here, it was shown that much can be learned from labor supply studies on general populations. At least until one considers fine details that are unique to professional nurses, the similarities with persons in other occupations would appear to outweigh the differences.

There is, however, a major difference between the results reported here and in chapter 4. The results of the earlier chapter clearly imply that nurse migration is unresponsive to financial incentives. Although there is still room for debate as to the *degree* of responsiveness, married nurse labor force participation and work hours *are* responsive to these factors. There is general agreement that unmarried nurses are not responsive to financial incentives in all of these dimensions, but a high proportion of these nurses work full time. Therefore, at least in terms of participation and work hours, they do not represent a target group from which more work can be obtained in any case.

Only one study, Sloan (1975), has included a detailed list of

potential work hours inducements, such as day care, as explanatory variables. Unfortunately, that study has limited value, because it is based on a labor force participants-only sample. In the future, this detailed specification should be applied to a sample of professional nurse participants *and* non-participants.

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Appendix A

HOSPITAL INSURANCE: SOME THEORY AND MEASUREMENT

As with all insurance, health insurance spreads the costs of outcomes over a large population sharing the risk of the outcomes. The health care risk most frequently shared is inpatient hospital care.

Many conjectures have been made about the effects on health services utilization of health insurance in general and hospital insurance in particular. Feldstein (1971), in his study of hospital cost inflation, concluded that the growth of insurance is the primary cause of hospital cost inflation via its demand-pull effects. Total coverage limits, sharing above thresholds, deductibles, indemnity-charge differentials, noncovered services, and proof-of-payment requirements—factors not considered in most econometric studies—complicate the picture at an exponential rate.

Pauly and Drake (1970) were among the first to formalize a *type* of insurance argument regarding cost-plus prices. According to them,

> . . . if hospitals received a fixed percentage of costs as a plus and we assume that they wish to maximize that plus in order to attain maximum number of patients in the long run, then cost-plus reimbursement leads to a perverse result. Hospitals which are striving to increase funds available for capital investment will try to increase costs, since that will increase the absolute amount of the plus they earn. If, however, payment is based on charges, as in Wisconsin, the long-run growth maximizing hospital has a positive incentive to minimize costs. (pp. 302–303)

As Klarman (1970) and Davis (1973) note, there is a conceptual error in the Pauly-Drake study, caused by the authors' omission of the proportion of patients in the hospital's market area covered by cost-based prices. Davis considers the proportion explicitly in her derivations and concludes that, with plausible plus factors, this proportion would have to be nearly 100 percent to provide an incentive for the hospital to raise costs.

The Davis derivations do not rectify all of the deficiencies in the Pauly-Drake study. Under charge-based prices—where the patient pays nothing—the third party pays the amount charged noninsured paying patients. To conclude that under charge-

based prices the hospital has an incentive to minimize costs is to state that the hospital's demand schedule is completely unaffected by hospital outlays. If all cost outlays above some minimum represent forms of inefficiency, the argument is correct. But if, in fact, a meaningful fraction of cost outlays are allocated to augmenting quality, the argument would only be correct in a world of extreme consumer *and* physician ignorance. Once quality enters the hospital's demand function, it is necessary to consider the inflationary effects of charge- as well as cost-based prices.

Using hospital demand and cost functions dependent on quantity and quality, it can be demonstrated that (1) both cost- and charge-based reimbursement may lead to explosive cost increases if there are no uninsured patients, and (2) the comparative effect of cost-based prices depends crucially on whether or not hospital marginal costs (with respect to X) are declining or increasing. With declining marginal costs, increases in quality, which in turn lead to output increases, *may* actually lower the third party payment to the hospital per unit of output under cost-based reimbursement.[1] With so many countervailing forces at work, the effects of particular kinds of reimbursement become an empirical issue. Theory enables one to understand the underlying forces, but it does not yield unambiguous predictions. The relative effects of alternative reimbursement modes is thus really an empirical issue.

Our measure of insurance *type* is COST, the estimated percentage of the hospital's county population covered by cost-based insurance prices. It includes Medicare and Medicaid populations as well as coverage under Blue Cross cost-based reimbursement. Cost-based plans are heterogeneous. All commercially insured and Blue Cross charge-based insured, as well as the noninsured population, are included in the omitted variable CHARGE. The noninsured population had a high measurement error relative to its mean of 4.9 percent, thus precluding consideration of the insurance versus no insurance questions, given our cross section data, even if this had been our concern.

We estimated COST (and CHARGE) by the hospital respondent's county as follows. An unpublished Blue Cross report gave population coverages by plan area; and other Blue Cross information gave (1) counties by plan and (2) methods of reimbursement by plan. Health Insurance Institute data for 1973 provided private insurance coverage proportions by State. Various Federal documents gave Medicare and Medicaid coverage by State

[1] *May* rather than *would* because increased quality would lead to increased third party payments in any case.

and the over-age-65 and poverty proportions (per U.S. Census definitions) by county in 1970. For Medicare, development of 1973 data involved a simple calculation necessary to update a 1970 county series to a 1973 series.

For Medicaid, it was necessary to perform more complex calculations, particularly since the Medicaid population does not correspond exactly to the poverty population. The method is best illustrated by an example. If a *county's* poverty proportion was 6 percent while the State's poverty proportion was 4 percent and the State's Medicaid proportion was 3 percent, the county's Medicaid proportion was estimated to be 4.5 percent (3·(6/4) = 4.5). Since the relationship between Medicaid enrollments and the poverty population largely reflects the State Medicaid statute, our method, though approximate, has a rationale in terms of the Medicaid proportion.

The county's total percentage—100 percent—was reduced by the county estimate of Medicare and Medicaid coverage and the State proportion of uninsured to give the Blue Cross and commercial insurance coverage percentage for the State. This remainder was apportioned to the hospitals' counties using the Blue Cross plan area proportions adjusted for the State uninsured proportion, assuming uniform coverage written a given State. Medicare and Medicaid coverage percentages by hospital county were added to the Blue Cross coverage percentage in areas where Blue Cross reimbursed on the basis of costs.

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Appendix B

FURTHER ANALYSIS OF NURSE SHORTAGE CRITERIA

The emphasis in chapter 2 is on investigating sources of variation in nurse staffing, not in developing specific measures of nurse shortages. This appendix continues work on nurse shortage definitions begun in Elnicki and Sloan (1975) and Elnicki (1975).

Elnicki and Sloan reported on the behavior of variables that have frequently been used in the past as shortage indicators, and developed new measures as well. The presence of vacancies and nursing directors' perceptions of nurse shortage are among the more traditional indicators. The Survey of Hospital Directors of Nursing also obtained data on two potential effects of nurse supply limitation: (1) delegation of professional nursing tasks to nonprofessional nurses ("job shifts") and (2) reductions in hospital bed capacity ("facility changes"). Fewer hospitals reported job shifts and/or outright facility changes than reported vacancies and/or stated they had an overall shortage of nurses. Moreover, comparing hospitals' responses on the latter to "action" questions, it is evident that a substantial number of hospitals report vacancies and/or perceived nurse shortages, but do not attribute any changes in the amount of services delivered or in the professional nurse intensity of their services due to a shortage of nurses. A greater amount of consistency would have been desirable for these measures to have real meaning.

Elnicki (1975) developed a set of job attribute combinations or "packages." The packages encompassed adequacy of parking facilities and residential accommodations within the vicinity of the hospital, payment of wage differentials for evening and night work, vacation and sick leave policy, educational opportunities for nurses available through the hospital, various working conditions and related hospital policies, and insurance benefits. These package variables and several other explanatory variables, descriptive of the hospital, were regressed on the hospital's quit rate. Essentially, no relationships between the packages and the explanatory variables were detected. Elnicki also conducted pairwise statistical tests between the hospital's quit rate and

various offerings. This analysis also failed to produce any statistically significant results.

Table B–1 defines a set of benefit "package" variables, using essentially Elnicki's scheme. Table B–2 compares hospitals satisfying the criteria for various packages as defined in table B–1, with hospitals that do not. For purposes of the comparisons, hospitals are grouped according to several possible shortage criteria: whether or not they have been designated as a loan forgiveness hospital; RN vacancies per bed; RN positions canceled because RNs are unavailable; whether non-RNs are used to perform RN tasks because RNs are unavailable; whether beds have been closed down or would be added if RNs were available; and whether the nursing director considers that the hospital is experiencing a shortage of RNs. We shall now examine patterns relating to each of these possible criteria. The F-test is used to assess whether groups are statistically significantly different from one another.

If a hospital has received a special loan forgiveness designa-

Table B–1.—Definitions of "package" variables

Variable	Definition
HOMEPAKG	Adequate or very adequate housing for RNs within walking distance of the hospital, or subsidized housing provided by the hospital
LEAVEPAKG	RN vacation and sick leave days per year greater than the survey means (RN employed 1 year)
EDUCPAKG	Inservice education budgeted for by hospital, and hospital offers its own refresher courses, or hospital subsidizes these
WORKPAKG	Secretaries or clerks at nursing stations; RNs frequently determine their own schedules; diploma graduates can fill supervisory positions; percent of RNs always working the same shift greater than average; percent of supervisory positions filled internally greater than average; and day notice given for a permanent shift change is greater than average or not applicable
INSURPAKG	Subsidized, convertible life insurance; subsidized convertible health insurance; all full-time RNs are eligible for a retirement plan after a waiting period; and hospitals' retirement contribution is not lost on termination after a waiting period or sickness and disability insurance is subsidized by hospital
SAFEPK	Hospital parking areas described as "safe" or "moderately safe"
SHFTPAKG	Hospital pays wage differentials for evening and night work
WAGEH	Hospital pays starting diplomates salary above survey mean

Table B–2.—Pairwise comparisons: Shortage measures and wage-benefit variables

Variable	Loan forgiveness			RN staffing hours/ beds			RN positions canceled/beds [1]			Use non-RNs for RN tasks			Beds closed down or would add beds or space			Hospital has experienced RN "shortage"		
	Mean	F	Signif.	Mean	F	Signif.	Mean	F	Signif.	Mean	F	Signif.	Mean	F	Signif.	Mean	F	Signif.
HOMEPAKG=0	0.53	12.29	0.001	116.4	9.54	0.002	0.077	0.00	0.999	0.35	1.37	0.240	0.13	7.98	0.005	0.55	0.04	0.999
HOMEPAKG=1	0.68			55.1			0.076			0.30			0.22			0.55		
LEAVEPAKG=0	0.58	0.02	0.999	94.2	0.28	0.999	0.070	1.41	0.233	0.34	2.21	0.085	0.14	4.74	0.028	0.56	0.72	0.999
LEAVEPAKG=1	0.59			106.0			0.099			0.27			0.23			0.52		
EDUCPAKG=0	0.55	3.13	0.074	122.5	12.79	0.001	0.071	0.52	0.999	0.34	0.56	0.999	0.13	3.58	0.056	0.53	1.87	0.168
EDUCPAKG=1	0.63			54.3			0.086			0.31			0.20			0.58		
WORKPAKG=0	0.59	2.53	0.108	100.3	1.00	0.999	0.087	1.26	0.262	0.33	0.05	0.999	0.16	0.54	0.999	0.55	0.07	0.999
WORKPAKG=1	0.49			72.2			0.046			0.32			0.13			0.53		
INSURPAKG=0	0.56	5.31	0.021	107.8	8.50	0.004	0.082	2.02	0.152	0.34	2.16	0.138	0.16	0.36	0.999	0.55	0.22	0.999
INSURPAKG=1	0.70			30.0			0.040			0.26			0.14			0.52		
SAFEPK=0	0.52	1.15	0.283	77.5	1.56	0.209	0.082	0.12	0.999	0.36	0.57	0.999	0.20	1.96	0.158	0.64	6.49	0.011
SAFEPK=1	0.57			103.9			0.074			0.32			0.15			0.52		
SHFTPAKG=0	0.51	2.86	0.087	190.4	28.2	0.001	0.179	4.55	0.031	0.28	1.70	0.190	0.13	0.94	0.999	0.48	2.95	0.082
SHFTPAKG=1	0.60			71.7			0.06			0.34			0.17			0.57		
WAGEH=0	0.59	0.020	0.999	115.8	5.3	0.020	0.081	0.17	0.999	0.34	0.20	0.999	0.11	10.9	0.001	0.47	13.23	0.001
WAGEH=1	0.60			68.4			0.072			0.32			0.22			0.63		

[1] Positions are expressed in full-time equivalent nursing hours.

tion, it receives the value 1; otherwise it receives a zero. Thus, a higher (lower) mean value in table B–2 indicates that a greater (smaller) proportion of loan forgiveness hospitals have the benefit offering as described in table B–1. Judging from table B–2, hospitals with the loan forgiveness designation offer more attractive benefits in a number of respects—superior housing, education benefits, insurance, and shift differentials. However, they rate somewhat lower in terms of working conditions and are about equal to other hospitals in terms of wages. Certainly, it cannot be said that hospitals with the loan forgiveness designation have failed to make a special effort to attract and retain professional nurses, at least in comparison to hospitals without this designation.

The vacancy measure is expressed in terms of vacant nurse hours per hospital bed. As with loan forgiveness, a higher mean value is indicative of a less desirable condition. The results, however, differ rather dramatically from those relating to loan forgiveness. Hospitals that are *less* attractive in terms of housing, education and insurance benefits, shift differentials, and wages report *higher* vacancy rates. Less satisfactory working conditions are also related to a higher vacancy rate, but the difference is not statistically significant.

There are essentially no differences in offerings according to the number of professional nursing positions canceled, expressed in hours per bed. Vacancies and canceled positions vary independently of one another. There are only a few differences between hospitals perceiving a shortage of nurses and those that do not. Shortage hospitals are more likely to offer shift differentials and pay wages above the average. On the other hand, parking is likely to be less adequate.

Turning to the measures describing specific consequences of nurse nonavailability, no consistent pattern is evident. Hospitals using non-RNs for RN tasks have relatively poor offerings, with the exception of wage-related compensation (SHFTPAKG and WAGEH). However, only one difference is statistically significant at the 10-percent level or better. Using changes in bed capacity as the criterion, hospitals experiencing difficulties in securing professional nursing personnel tend to have more favorable offerings than when the delegation to non-RNs measure is used.

These comparisons between offerings and selected shortage criteria fail to yield a consistent pattern. When the loan forgiveness designation is used as the criterion, hospitals experiencing shortages appear to be making special efforts to secure professional nurses. When hospital vacancies are the criterion, one gains the opposite impression. In other cases, there are few sig-

nificant differences in either direction. Our failure to find consistent patterns in table B–2 should serve as a warning against the indiscriminate use of these indicators for public policy purposes. These results reinforce findings on the quit rate reported in Elnicki (1975).

In a further attempt to give meaning to these shortage criteria, we hypothesized a relationship between the residuals from a staffing regression and the shortage measures. The underlying rationale is this. Our model specifies desired staffing levels as a function of categories of variables exogenous to the hospital. It is possible that unspecified conditions cause actual hospital staffing levels to fall short of desired levels. If so, one should find a consistent relationship between various shortage measures and the regression's residuals, defined as the predicted minus the actual value. As defined, when the residual is strongly positive, there is an indication that the hospital has actually employed far fewer nurses than one would expect to be the case, given levels of the included exogenous variables.

Classifying hospitals on the basis of vacancies per bed, positions canceled per bed, loan forgiveness designation, and perceived shortages, we find the residuals to be statistically significantly higher at the 5-percent level in the case of the loan forgiveness designation and almost at the 5-percent level in the case of perceived shortages. No relationships are found at all in the case of the first two measures. Since the score is two "for" and two "against," it is difficult to say whether the data support our hypothesis or not. Certainly, before any of these measures are used for policy purposes, it is desirable that greater consistency among measures be established.

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Appendix C

SUPPLEMENTARY TABLES TO THE INTERSTATE ANALYSIS OF NURSE MIGRATION

This appendix presents descriptive tables based on the census data source. The tables use less stringent screens than those in the analysis presented in the text. Specifically, there is a screen on educational attainment. All nurses must have completed 12 years of schooling or more, but there are no screens on occupation in 1965 as in the text.

Table C–1 shows that the propensity of interstate moves is highly dependent on the presence of children and age, especially

Table C–1.—Interstate moves: 1965 to 1970

Demographic Group	Percent moved: 1965 to 1970
Married nurses	
21 to 29 without children	34.5
30 to 39 without children	18.7
40 to 60 without children	4.7
21 to 29 with children	27.0
30 to 39 with children	15.0
40 to 60 with children	7.0
Unmarried nurses [1]	
21 to 29	35.6
30 to 39	24.4
40 to 60	7.4
All of the above nurses	18.2

[1] All without children.

the latter. This table reinforces the tabulations presented in table 9 in the text. The change in the screening criterion results in about a 4-percentage point increase in the overall migration rate. Table C–2 gives information on hours and weeks of work. Marital status and the presence of children are clearly more important factors in the work hours than in the migration decision. Labor force participation is nearly universal among unmarried nurses.

Table C–3 shows the distribution of spouse occupations by age and the presence of children. It is apparent from this table that a

Table C–2.—Hours and weeks worked

Demographic group	Hours (per week)			Weeks (in 1969)		
	Mean (including 0)	Mean (excluding 0)	Percent zero	Mean (including 0)	Mean (excluding 0)	Percent zero
Married nurses						
21 to 29 without children	29.4	38.3	23.1	41.1	42.5	17.9
30 to 39 without children	28.1	36.2	28.0	39.9	43.9	9.1
40 to 60 without children	25.2	37.4	32.7	36.3	43.2	16.0
21 to 29 with children	11.9	28.3	42.1	22.2	32.6	31.8
30 to 39 with children	15.4	29.6	47.9	25.2	37.8	33.2
40 to 60 with children	23.3	33.2	29.7	34.0	40.5	16.1
Unmarried nurses [1]						
21 to 29	36.1	40.1	10.1	41.5	42.5	2.3
30 to 39	37.2	41.4	10.2	45.8	46.8	2.3
40 to 60	35.2	40.7	13.4	44.2	46.3	4.5

[1] All without children.

Table C–3.—Distribution of spouse occupations for married female nurses

Occupation group [1]	No children			At least one child		
	age 21–29	age 30–39	age 40–60	age 21–29	age 30–39	age 40–60
1	34.5	30.3	17.6	33.7	31.7	23.8
2	17.3	12.5	16.2	10.2	17.2	17.0
3	14.8	12.2	17.6	12.1	15.4	17.8
4	25.2	38.7	47.2	39.0	35.7	40.2
None	8.2	6.3	1.4	5.0	3.7	1.2
All	100.0	100.0	100.0	100.0	100.0	100.0

[1] Occupation group 1: Professional, technical, and kindred workers.
Occupation group 2: Managers and administrators.
Occupation group 3: Sales, clerical, and kindred workers.
Occupation group 4: Craftsmen and kindred workers, operatives (including transport workers), farm laborers and foremen, and service workers (including private household workers).

much higher proportion of the younger nurses are married to persons with professional occupations.[1]

Table C–4 compares net migration flows experienced by States during the 1965–70 period. Since the table is based on the One Percent Public Use Sample of the Census, the estimates of the number of nurses in the State during 1965 and on the net change in the number of nurses over the 1965–70 period should be multiplied by 100. As this table indicates, the pattern of nurse interstate migration during this period was quite similar to that of the U.S. population as a whole. This is not surprising, especially since market opportunities outside nursing (i.e., those affecting the spouse) appear to be important migration determinants.

References

Knopf, L., *RN's: One and Five Years After Graduation: A Report on the Nurse Career-Pattern Study*. New York: National League for Nursing, 1975.

[1] To my knowledge, only one other study gives occupational information on nurses' spouses (Knopf, 1975). Unfortunately, the categories presented in that study are not comparable to the ones presented here.

Table C–4.—Migration flows of RNs—1965 to 1970

State	Number of RNs in 1965 (× 100)	Net change (× 100)	Percent change RNs	Percent change population as whole
Florida	338	44	13.0	9.9
Washington	233	28	12.0	6.2
Virginia	260	31	11.9	1.5
Oklahoma	122	14	11.5	0.1
Nevada	20	2	10.0	5.1
Arizona	105	10	9.5	7.0
Vermont	37	3	8.1	3.2
Maryland	232	16	6.9	3.5
New Hampshire	82	5	6.1	3.7
Montana	34	2	5.9	−5.0
California	1,208	64	5.3	4.2
Nebraska	77	4	5.2	−2.8
Massachusetts	452	19	4.2	−0.8
Tennessee	161	5	3.1	0.1
West Virginia	83	2	2.4	−4.4
Texas	524	11	2.1	1.3
Mississippi	100	2	2.0	−2.1
Connecticut	211	4	1.9	0.7
Michigan	455	5	1.1	0.0
Georgia	182	2	1.1	1.7
Colorado	143	1	0.7	4.2
Minnesota	250	1	0.4	−0.3
New Jersey	500	1	0.2	0.6
North Carolina	250	−2	−0.8	0.4
Indiana	250	−3	−1.2	−0.8
Missouri	214	−3	−1.4	0.1
Oregon	118	−2	−1.7	2.9
Delaware	42	−1	−2.4	2.4
Idaho	42	−1	−2.4	−1.6
Pennsylvania	708	−17	−2.4	−1.6
Arkansas	71	−3	−4.2	−0.7
Louisiana	136	−6	−4.4	−1.1
Kansas	130	−6	−4.6	−2.1
New York	1,059	−54	−5.1	−3.1
Illinois	566	−30	−5.3	−1.9
Ohio	537	−29	−5.4	−0.8
Wisconsin	211	−12	−5.7	−0.5
Wyoming	17	−1	−5.8	−6.1
Kentucky	92	−6	−6.5	−1.5
Iowa	167	−11	−6.6	−2.6
Maine	69	−5	−7.2	−2.1
North Dakota	39	−3	−7.7	−7.8
Alabama	129	−11	−8.5	−6.9
South Carolina	91	−9	−9.9	0.5
South Dakota	36	−5	−13.9	−6.9
Rhode Island	56	−10	−17.9	0.9
New Mexico	42	−9	−21.4	−5.5
Utah	34	−10	29.4	−1.2

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Appendix D

MULTIPLE LOGIT ANALYSIS

This appendix describes multiple logit analysis, a technique used in chapters 5, 6, and 7. Suppose there are n choices and x_i is a vector of individual characteristics and/or community characteristics pertaining to the individual, then the probability that the ith alternative is selected by the person with individual and/or community characteristics x is:

$$(D.1) \qquad P_i = e^{\alpha' i x} \Big/ \sum_{m=1}^{n} e^{\alpha' m x}$$

Given a like expression for P_j, taking logs, and dividing P_i by P_j:

$$(D.2) \qquad \log_e(P_i P_j) = (\alpha_{i0} - \alpha_{j0}) + (\alpha_{i1} - \alpha_{j1})x_1 + (\alpha_{i2} - \alpha_{j2})x_2 \ldots$$

With multiple logit analysis, one estimates n−1 functions, such as (D.2), from which all of the underlying parameters may be derived. In the present case, four functions are estimated. The choice of denominator probability (i.e., the nth category) is fully arbitrary and irrelevant for purposes of estimation. For example, $\log_e(P_k/P_i)$ may be derived once functions for $\log_e(P_k/P_i)$ and $\log_e(P_j/P_i)$ have been estimated, since $\log_e(P_k/P_j) = \log_e(P_k/P_i) - \log_e(P_j/P_i)$. A chi-square test with n−1 degrees of freedom is used to test the null hypothesis that a specific explanatory variable makes no contribution to the choice among the alternatives. The overall test of significance is also a chi-square with (number of variables) (number of groups − 1) degrees of freedom.

A "pseudo" R^2 for use in assessing the model's explanatory power can be calculated from:

$$(D.3) \qquad R^2 = \frac{1 - \exp\left[\frac{2}{n}(L_w - L_r)\right]}{1 - \exp\left[\frac{2}{n}(L_w - L_{max})\right]}, \quad \text{where:}$$

L_w = log-likelihood with only a constant term included;
L_r = log-likelihood with all explanatory variables included;
L_{max} = maximum possible value of the log-likelihood. (In this model, $L_{max}=0$).[1]

[1] My thanks to G.S. Maddala for providing me with the formula for the pseudo R^2. Some additional detail on multiple logit analysis is provided in Schmidt and Strauss (1975).

Equation (D.2) serves as the basis for hypothesis-testing; furthermore, one may determine direction of effect from (D.2). For example, if $(\alpha_{i1}-\alpha_{j1})$, the parameter estimate associated with the variable x_1, turns out to be negative, one has an indication that increases in x_1 raise the probability that the observation belongs to the jth rather than the ith group. A positive parameter estimate would have the opposite implication.

A parameter estimate, such as $(\alpha_{i1}-\alpha_{j1})$, does not permit one to assess the degree to which the probabilities are influenced by changes in the explanatory variables x. The method used to gauge responsiveness, though straight forward is best illustrated by an example. To simplify the discussion, assume n=2. Therefore, parameters of one function, such as (D.2), are to be estimated. Furthermore, assume there is only one explanatory variable x_1. Then (D.2) becomes:

(D.2a) $\log_e(P_1/P_2) = (\alpha_{10}-\alpha_{20}) + (\alpha_{11}-\alpha_{21})x_1$.

Given parameter estimates $(\alpha_{10}-\alpha_{20})$ and $(\alpha_{11}-\alpha_{21})$ *and* an assumed value for x_1, one can calculate predicted probabilities P_1 and P_2. With the parameter estimates, and an assumed value of x_1, say 4.0, (D.2a) becomes:

(D.2b) $\log_e(P_1/P_2) = (\alpha_{10}-\alpha_{20}) + (\alpha_{11}-\alpha_{21})\cdot 4.0 = C$, where C is any resulting number.

Since, $P_1 + P_2 = 1$ (D.2c), by definition, there are two equations (D.2b) and (D.2c), and two unknowns, P_1 and P_2. The solutions are $\overline{P}_1$ and $\overline{P}_2$, probabilities conditional on the assumed value of x_1. Generalizing, one solves n equations with n unknowns, P_1 through P_n.

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Appendix E

CONCEPTUAL AND STATISTICAL CONSIDERATIONS: NURSE HOURS OF WORK PATTERNS

In this appendix, the "shadow wage" function for a "representative" married woman is first derived. This is followed by a brief discussion of statistical problems that arise in the analysis of a group in which labor force participation is far less than universal. Work hours patterns of married women are more difficult to assess statistically than are those of unmarried women, because a far lower proportion of married women participate in the labor force. Throughout this discussion, it is assumed that data on individuals rather than aggregated data are used. Overall, data on individuals are preferable, because they allow one to avoid potential problems of aggregation bias in the estimated parameters.

Assume, for simplicity that the household's preferences can be described for a single period by a utility function with certain desirable properties (twice differentiable, strictly concave utility function).

(E.1) $U = U(X,H_\ell,F_\ell;Z)$

where: X is a composite of goods purchasable in the market; H_ℓ and F_ℓ are time husband and wife have available for activities other than work in the marketplace; Z is a vector of parameters that determine the tradeoff between purchased goods and nonmarket time. The household faces both time and budget constraints

(E.2) $H = H_\ell + H_m$
$F = F_\ell + F_m$

where: H and F are the total time husbands and wives have available to devote to market *and* nonmarket pursuits (assumed to be constant); H_m and F_m are time devoted by husband and wife to market pursuits, i.e., their jobs, and

(E.3) $XP_x = W_hH_m + W_fF_m + Y$

where: P_x is a price index of the goods composite; W_h and W_f are the wages obtainable by husband and wife in the marketplace; Y is the level of household income from nonemployment sources (assumed to be constant).

Maximization of U subject to time and budget constraints is

accomplished by forming a function ϕ and taking first derivatives with respect to the decision variables, which in this instance are H_ℓ, F_ℓ, and X, and λ.

$$\text{(E.4)} \quad \phi = U(X,H_\ell,F_\ell;Z) + \lambda[XP_x - W_h(H - H_\ell) - W_f(F - F_\ell) - Y]$$

$$\text{(E.5)} \quad \frac{\partial \phi}{\partial H_\ell} = \frac{\partial U}{\partial H_\ell} + \lambda W_h = 0$$

$$\text{(E.6)} \quad \frac{\partial \phi}{\partial F_\ell} = \frac{\partial U}{\partial F_\ell} + \lambda W_f = 0$$

$$\text{(E.7)} \quad \frac{\partial \phi}{\partial X} = \frac{\partial U}{\partial X} + \lambda P_x = 0$$

$$\text{(E.8)} \quad \frac{\partial \phi}{\partial \lambda} = XP_x - W_h(H - H_\ell) - W_f(F - F_\ell) - Y = 0$$

In the traditional textbook case, equations (E.5) through (E.8) represent a system of four equations with four unknowns. Solutions to H_ℓ, F_ℓ, X, and λ are found as functions of the exogenous variables Z, P_x, H, F, W_h, W_f and Y. Labor supply functions most often use H_m and F_m as dependent variables, but these are known once H_ℓ and F_ℓ have been determined (since $H = H_m + H_\ell$, etc.)

Any solution of this type must be consistent with the following kinds of conditions. For example, dividing equation (E.6) by equation (E.7), one has

$$\text{(E.9)} \quad \frac{\frac{\partial U}{\partial F_\ell}}{\frac{\partial U}{\partial X}} = \frac{w_f}{P_x}$$

The left hand side of (E.9) gives the amount of the wife's nonmarket time (or leisure) the household is willing to give up for another unit of the composite commodity X (at the margin). The right side shows the amount of X the household will get if the wife actually makes this trade. In equilibrium the two sides are equal. The left side may be referred to as the wife's "shadow" or "reservation" wage. The right side is her market wage (in real terms).

Thus, letting W_s be the wife's shadow wage and, for simplicity, $P_x = 1$, then another way of writing (E.9) is

$$\text{(E.10)} \quad W_s = W_f.$$

According to (E.10), the wife will work at the point where the tradeoff between her time and the goods composite, the shadow wage, equals the market wage. While W_f may as a first approximation be assumed to be invariant with respect to the wife's market time, the same cannot be said for W_s. Without imposing a specific functional form on the household preference function, it

is not possible to say whether W_s rises or falls with increases in F_m. However, a substantial body of empirical research on the work patterns of married women suggests a positive relationship. This means that as market time increases (alternatively nonmarket time decreases), the value the household imputes to the final unit of nonmarket time increases. That is, holding other factors constant, a woman who works a 60-hour week will have a greater aversion to working a 61st hour than a woman working 20 hours will have to working a 21st hour. The relationship between the shadow wage and work hours is an important one.

For years, texts describing the above model have noted that at least some equations in the set (E.5) through (E.7) may not equal zero for any value of the decision variables. Specifically, with reference to the female time equation (E.6), $\frac{\partial U}{\partial F_\ell} + \lambda W_\ell$ may exceed zero for all allowable values of F_ℓ (and F_m). If this is so, and $\frac{\partial U}{\partial X} + \lambda P_x$ from (E.7) is zero, as one has every reason to believe would be the case, (E.9) becomes an inequality.

$$\frac{\frac{\partial U}{\partial F_\ell}}{\frac{\partial U}{\partial X}} > \frac{w_f}{P_x} \quad \text{, or equivalently,}$$

(E.11) $W_s > W_f$ (E.11) for all values of F_ℓ.

Since W_s is likely to increase with F_m, if the inequality holds at $F_m = 0$ which is the minimum a person can work, it holds everywhere.

Inequality (E.11) is the relevant one for labor force nonparticipants; equation (E.9), by contrast, holds for participants. Intuitively, the inequality means that for all conceivable values of work hours, the wife requires a greater amount of the goods composite that she is able to obtain from the market. Therefore, she devotes none of her allocable time to work outside the labor force.

When equations (E.5) through (E.8) are satisfied, it is possible, as noted above, to solve for the endogenous variables in terms of the exogenous variables. The equation expressing F_m ($F_m = F - F_\ell$) as a function of the model's exogenous variables has served as the basis for econometric research on work hours of married women. Since $W_s = W_f$, if the wife participates, a measure of W_f is the appropriate exogenous explanatory variable to use in a regression with F_m as the dependent variable. However, if W_s exceeds W_f everywhere, the use of W_f in this manner is not only

theoretically inappropriate, but there is a potential for biased parameter estimates as well.

One alternative way of seeing the theoretical problem is to consider W_s the asking price and W_f, the price offered. If the two prices can be made equal, the buyer and seller of labor make a deal. If the asking price always exceeds the price offered, an agreement cannot be concluded. When W_s equals W_f, the relationship between work hours and the asking price is accurately measured by W_f. This, of course, is not the case when W_f systematically understates W_s. Even worse, there is no recorded measure of W_f when a person performs no market work.

Three Alternative Approaches

There are several potential "solutions." Although none is ideal, recent econometric research has at least clarified the nature of the consequences of using each technique.

First, one could restrict the analysis to labor force participants for which equations (E.5) through (E.8) hold. In regression analysis, F_m would be the dependent variable, and W_f, W_h, Y, P_x, and Z, the explanatory variables. That is,

(E.12) $F_m = G(W_f, W_h, Y, P_x, Z)$. Since $W_s = W_f$, a fully equivalent relationship is

(E.13) $W_s = G'(F_m, W_h, Y, P_x, Z)$.

There would be absolutely no question about the appropriateness of this procedure if the objective of the analysis were to analyze work hours of labor force participants. But this is generally not the case. Certainly from the vantage point of policy, it is desirable to have information on all persons in a labor category, not only those who participate. This is definitely true in the case of nurses.

This first approach introduces an econometric problem that is likely to bias the parameter estimates toward zero (understate the true parameter when it is positive and overstate it—make it more positive—when the true parameter is negative). In particular, estimates of the woman's work hours response to changes in her wage are likely to be understated.

An econometric problem arises because the expectation of the F_m equation's error term is no longer zero, since only a segment of women—working women—is selected; and furthermore, as seen in Cogan (1974), the error varies systematically (inversely) with the equation's explanatory variables.[1] Under exceptional circumstances, i.e., no differences in tastes unaccounted for by

[1] The econometric discussion for the remainder of this section has been principally derived from Cogan (1974).

the Z-type variables, the parameter estimates can be shown to be unbiased. However, complete specification of the Z-type explanatory variables is unlikely. Several studies using this first approach were discussed in the text: Bognanno, *et al.* (1974); Sloan (1975); part of Sloan-Richupan (1975), and Jones, *et al.* (1976). The parameter estimate biases inherent in this method apply to these studies, at least if one generalized the results from a sample of participating professional nurses to professional nurses on the whole.

A second approach employs the entire sample of married women, both employed and not in the labor force, to derive estimates of the labor supply equation. As no wage rates are observable for nonemployed women, it is necessary to assign "potential" market wage measures to these women. Using a sample of working women, this task is generally accomplished by regressing W_f on a set of explanatory variables accounting for variations in W_f. The parameter estimates obtained from this regression are then used to predict a value for W_f for all women, whether they are employed or not.

This technique is not free of potential deficiencies either. Unlike the first approach, the sample used for the hours of work regression contains both participants and nonparticipants. This is a desirable feature. However, the parameter estimates from the wage regression are based solely on a sample of working women. As a result, the expectation of the wage regression's error term may no longer be zero, and under probable circumstances, the error term may be negatively correlated with the market wage regression's explanatory variables. This would not be so if the wage regression included all pertinent determinants of market wage rates as explanatory variables, one objective that is very difficult to realize in fact. To the extent that important explanatory variables are omitted, estimates of market wage parameters are biased toward zero, and the predicted wage series, used in the hours of work regression, tends to understate the differences in potential market wages among persons in the sample. The use of the compressed wage series in turn results in work hours regression parameter estimates that overstate the impact of market wages on hours of work.

As noted above, there are actually two models, depending on the wife's participation status. For participants, equations (E.5) through (E.8) are solved for values of the decision variables; for nonparticipants, only (E.5), (E.7), and (E.8) are solved with F_m set equal to zero. In between the two states there is a participation threshold. An hours of work equation with W_f as one of the explanatory variables is strictly only applicable for participants.

Until the threshold is reached, increases in W_f have no impact on work hours. Thereafter, assuming a work hours response greater than zero, even small increments in W_f have some effect on F_m. Yet before the participation threshold is reached, increases in W_f, other factors being equal, do raise the probability that the participation thereshold will be reached, or equivalently, that the point where $W_s = W_f$ will be reached.

Tobit analysis is appropriate when both the probability that an action occurs and the extent of the action, once it occurs, are analyzed simultaneously. Tobit analysis applies in cases where there are discontinuities in the underlying theory of the type considered here. The Sloan-Richupan (1975) study used the second approach and, with it, Tobit analysis.

A third approach has been developed by Heckman (1974). This very imaginative technique allows one to derive unbiased parameter estimates without the need for making very strong assumptions about error terms. However, while Heckman's approach is far superior to the first two approaches on statistical grounds, it is also much more costly to implement.

The first three approaches are both oriented toward secondary data and are nonexperimental. Several studies have requested direct information from nonparticipants on the wage that would induce them to accept employment. Presumably, the same type of questioning could be pursued in research on nurse hours of work. The deficiency of this method lies in the nature of hypothetical questions. Would the nonparticipants indeed do what they say they would do?

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